MECHANICAL EQUIPMENT OF A MODERN DEPARTMENT STORE

THE HEATING AND VENTILATING MAGAZINE

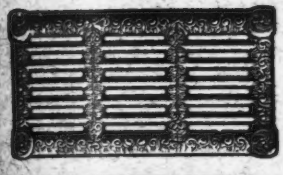
VOL. V., NO. 2 NEW YORK, FEBRUARY, 1908 $1.00 a year, 10 cents a copy

GURNEY HEATERS
FOR HEATING ANY DESCRIPTION OF BUILDING BY STEAM OR HOT WATER
THEY GIVE ENTIRE SATISFACTION · SEND FOR CATALOGUE
GURNEY HEATER MANUFACTURING CO.
NEW YORK OFFICE 12 E 42ND ST. 188-200 FRANKLIN ST. BOSTON.

KIELEY
Kieley & Mueller
34 West 13th Street
New York City, N. Y.

Reducing Valves and Steam Traps for all services; Damper Regulators, Back Pressure and Relief Valves. Grease Extractors and Steam Separators, Pump Governors, Pump Regulators, Float Valves, Water Arches, Hot Water Temperature Controllers, Water Feeders, etc.

Steam Specialties



FOWLER & WOLFE MANUFACTURING CO.
ORIGINATORS OF WALL RADIATION
Bourse Building, Philadelphia, Pa.
WE GUARANTEE OUR WALL RADIATION:
To contain the rated surfaces.
To have been tested at 100 lbs. pressure before shipment.
To provide for perfect circulation when installed in either vertical or horizontal form.
We challenge any other manufacturers of wall radiation to equal the above guarantee.

THOMAS F. CUSHING CO.
IRON AND STEEL PIPE
40 EAST 21st ST. Between Broadway and Fourth Ave. NEW YORK

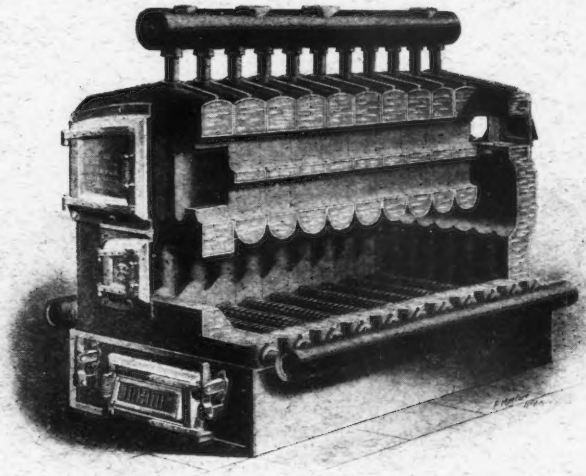
THE COVERING AND SUPPLY CO.
Manufacturers, Dealers and Contractors in
ASBESTOS MATERIALS
STEAM PIPE AND BOILER COVERINGS
OF EVERY DESCRIPTION
OFFICE and WAREROOMS
232 WEST ST., NEW YORK

STANDARD TEMPERATURE REGULATION CO.
WEST STREET BUILDING, WEST AND CEDAR STS., NEW YORK
AUTOMATIC HEAT REGULATION

Entered as second-class matter at the Post-Office in New York, N. Y. Copyright, 1908, by A. S. Armagnac.

SIROCCO FANS AND BLOWERS. SEE PAGE VIII

BOILERS AND RADIATORS



MERCER BOILER.

STEAM AND WATER WARMING.

Grate 18, 27 and 36 inches wide.

Write for Catalog.

THE H. B. SMITH CO.

WESTFIELD, MASS.

SALESROOMS:

728 Arch St., Philadelphia. 133 Centre St., New York.

PACIFIC COAST AGENTS

Holbrook, Merrill & Stetson, Los Angeles and Oakland, Cal.

EUROPEAN AGENTS

August Eggers, Bremen and New York.

Pipe, Fittings, Valves and Engineering Specialties

Automatic Air Valves

TRADE (S) MARK

Double Connection
Circulating
Syphon Action

A Guaranteed Valve

No. 1. Price, $1.15
Side Outlet, with Cap

No. 6. Price, $1.35
Side Outlet—Lock Shield

No. 3. Price, $1.15
Bottom Outlet, $\frac{1}{8}$ or $\frac{1}{4}$ inch

These valves are the best made in every respect. Small holes and tubes are avoided, to prevent clogging. Being fitted with Double passages into the Radiator, all danger of throwing water and water clogging is eliminated. The Expansion post is made of an indestructible, highly sensitive compound, insuring quick action. The Workmanship is perfect, the Plating extra heavy and every valve tested and guaranteed for five years.

JOHN SIMMONS CO.

OFFICES AND SALESROOMS
110 Centre Street, New York

When writing mention Department E

MACHINE SHOP	FACTORIES AND SHOPS	DOCK
48 to 58 Baxter St., N. Y.	*155-161 Leonard St., 5-7 Franklin St., N. Y.*	*381 South St., N. Y.*

FOUNDRY AND PIPE BENDING SHOP
Newark, N. J.

If you are not using **SUNRAY HEATERS** and **ROMAN RADIATORS** in your business, why not?

ORDER ONE AND YOU WILL ORDER MORE

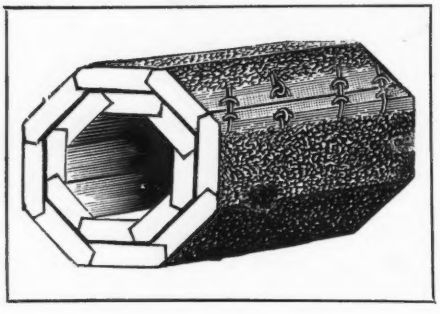
Our Fitters' Companion Mailed On Request

The J. L. Mott Iron Works

Fifth Avenue and 17th Street, New York

BOSTON CHICAGO DENVER SAN FRANCISCO

Steam Economy Talks—2



¶ Where steam pipes are in place and cannot be disconnected we furnish the Wyckoff Patent Steam Pipe Covering as shown in the accompanying cut, illustrating the manner of preparing the covering for cutting lengthwise. Remove the asphaltum coating and staple the wire on each side of the joint, as shown in cut. File or cut the wire between the staples. This will allow the outside covering to be opened. Then cut the paper on the inside shell, staple and cut wire same as outside. If this covering is to be cut in halves, remove coating, staple and cut wires at the opposite joint in the same manner.

Tests made by Prof. R. C. Carpenter of Cornell University show that the transmission of sufficient steam to produce 100 horse power for a distance of 1000 feet in naked steam pipes exposed to still air resulted in a loss through radiation and condensation of 37.6 per cent.

The same pipe covered with wood and solid earth lost 11.2 per cent.

The same pipe enclosed in Wyckoff's Patent Steam Pipe Covering lost *only 4.2 per cent.*

Catalogue F will give you every particular
May we send you a copy?

A. Wyckoff & Son Co.
ELMIRA, N. Y.

The Heating and Ventilating Magazine

VOL. V No. 2

Contents for February, 1908

Fourteenth Annual Meeting, American Society of Heating and Ventilating Engineers - - - - - - 1

Discussion of Report of Committee on Fan Blast Heating 6

Standard Methods of Figuring Hot Water Radiation - 12
Report of Committee on Hot Water Heating for Residences, with Discussion.

Heating and Ventilating a Modern Department Store - 18
John G. Eadie
Mechanical Equipment of B. Altman & Co.'s New Building, New York.

Austrian Coefficients for the Transmission of Heat Through Building Materials - - - *W. W. Macon* 36

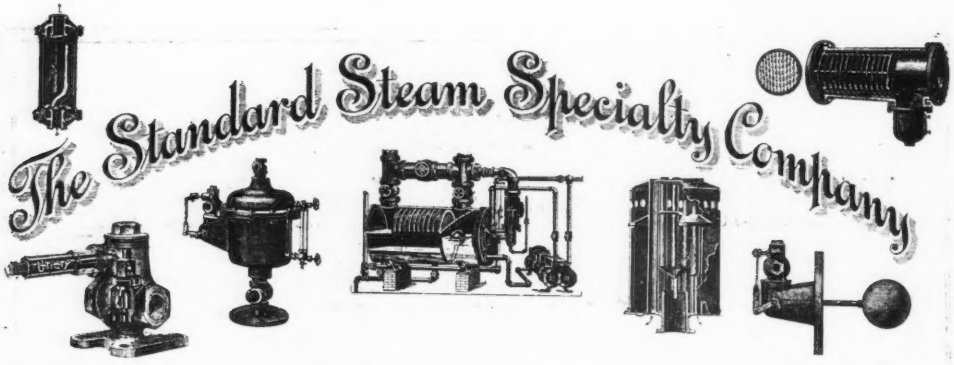
Additional Radiation for Warming Rooms Exposed to Strongest Wind Effects - - - - - - - 38

The Weather for January - - - - - - - 42
New York, Boston, Pittsburg, Chicago and St. Louis.

Trade and Miscellaneous Notes - - - - - ix

YEARLY SUBSCRIPTION, $1.00 SINGLE COPIES, 10 CENTS

Published monthly by the Heating and Ventilating Magazine Co., 1123 Broadway, New York.



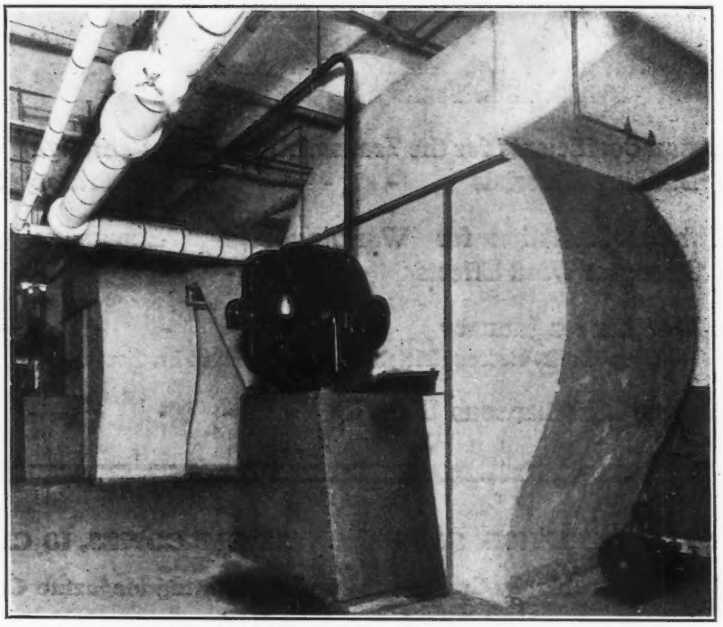
Utility Exhaust Muffler, Oil Separator, Return Tank
Pump Governor and Feed Water Heater
Utility Vertical Steam Receiver and Separator
Utility Pump Governor Valve and Head
Utility Pump Governor Valve
Utility Steam Separator
Utility Pump Governor
Utility Exhaust Head

Specify **Utility** Specialties in your work and we will guarantee their value in use.

Send for Catalogue H

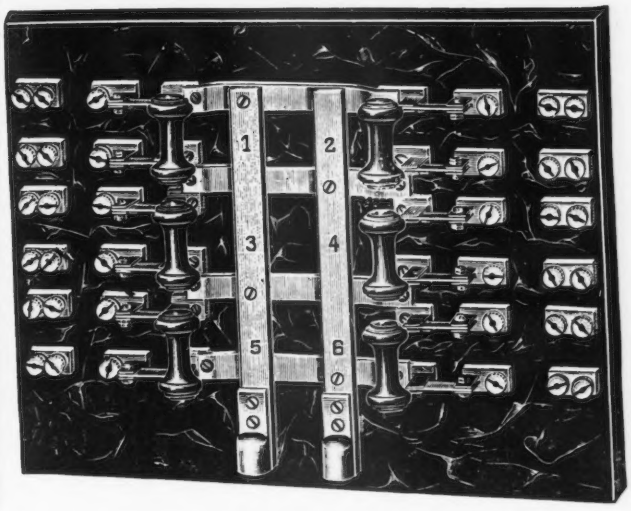
542-544 WEST BROADWAY, NEW YORK

"A.B.C." Fans and Heaters are used exclusively throughout the system described on pages 18-33.



PART OF THE ALTMAN STORE VENTILATING EQUIPMENT

141 BROADWAY NEW YORK **AMERICAN BLOWER CO., Detroit** MARQUETTE BLDG. CHICAGO



Give Us Your Orders for

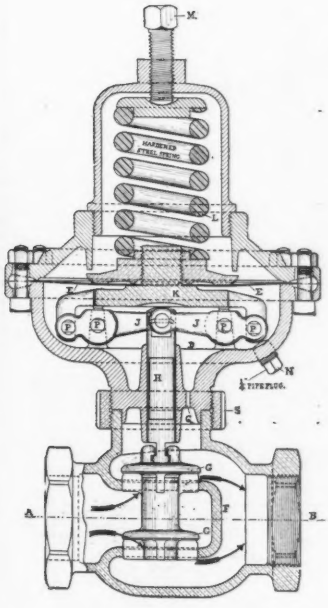
Switches
Switch-boards
Panel-boards, etc.

If you want quick deliveries and first class material.

The Metropolitan Switchboard Co.

532-540 WEST 22d STREET - - NEW YORK

ONE OF OUR SWITCHBOARDS ILLUSTRATED ON PAGE 22



The "Cash Standard"

Pressure Reducing and Regulating Valves

Simple Practical Durable

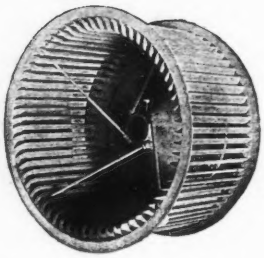
For low pressure heating and high pressure power purposes

Bronze bodies and phosphor bronze diaphragms. Slight modifications adapt then for all services

Let me advise you as to proper size and location of valve to give best service and save you money. Over 15 years' practical experience.

Write for Bulletins 204 and 205

A. W. CASH, 20 Court St., Newark, N. J.



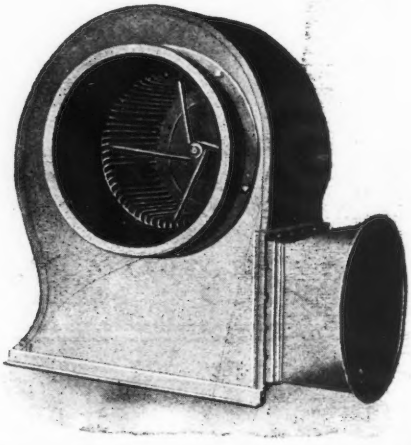
"SIROCCO"

TRADE MARK

BLOWERS

For Ventilating, Heating, Drying, Cooling, Forced and Induced Draft.
Belt, Motor or Engine Driven.

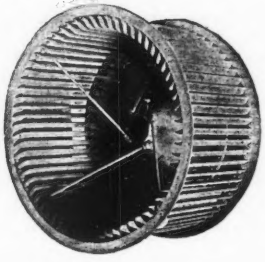
Fitted to Steam Turbines.



SMALLEST BUT MOST POWERFUL

THE ORIGINAL TURBINE TYPE

Covered both in Principle and Construction by U. S. Letters Patent issued in 1900, 1901, 1902, 1903, 1904, 1905, 1906



Sirocco Engineering Company

138 Cedar St., - - - NEW YORK

WORKS: TROY, N. Y.

BELFAST LONDON BERLIN VIENNA

THE HEATING AND VENTILATING MAGAZINE

1123 BROADWAY NEW YORK FEBRUARY, 1908

AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS

Report of Proceedings, Fourteenth Annual Meeting, New York, Jan. 21-23, 1908

COMMITTEES THAT WILL UNDERTAKE SPECIAL WORK DURING THE YEAR

Committee to Collect Data on Steam Pipe Sizes. Chairman, Jas. A. Donnelly, 132 Nassau Street, New York.

Committee to Collect Data on Fan-Blast Heating. Chairman, Wm. G. Snow, Tremont Bldg., Boston, Mass.

Committee to Collect Data on the Amount of Heating Surfaces of House Heating Boilers.

Committee to Collect Data on Air Washers.

An unusual number of new faces, some splendid committee reports, and exhaustive discussions of the papers and topics on the programme were the notable features of the fourteenth annual meeting of The American Society of Heating and Ventilating Engineers held in New York, January 21-23, 1908. The papers themselves, though few in number, were on lines that aroused much general interest, as, for instance, in the case of Mr. Thomson's paper on the "Relative Corrosion of Wrought-Iron and Soft Steel Pipes." The author not only brought with him portions of the pipes under test, which were illustrated in his paper, but in addition made a number of demonstrations that were followed with deep interest, showing methods of identifying wrought-iron and steel pipe.

Among the special actions taken by the society was the election to honorary membership of Charles B. Newton, of Baltimore, who was the first president of the society. This action was taken on the unanimous recommendation of the board of governors. Mr. A. B. Franklin, of Boston, in proposing his name testified to the high regard in which Mr. Newton has always been held, and referred to his own early association with Mr. Newton and to the sympathetic interest shown him and others who were starting out on their careers as heating and ventilating engineers. This willingness to impart his knowledge to others, said Mr. Franklin, is but one of the generous traits of this kindly old man who has now passed the age of fourscore years. On Mr. Franklin's motion, Prof. R. C. Carpenter was directed to cast one ballot for Mr. Newton, which was done.

The opening session was called to order Tuesday afternoon, January 21, by President C. B. J. Snyder. The following members and guests attended the various sessions:

MEMBERS AND GUESTS

Homer Addams, Philadelphia.
N. P. Andrus, Brooklyn.
A. S. Armagnac, New York.
E. P. Allen, Chicago.
Wm. E. Austin, Baltimore.
George S. Aldous, Passaic, N. J
John S. Brennan, Milwaukee.
C. M. Broadnax.
Thomas Barwick, New York.
George Barr, Philadelphia.
H. J. Barron, New York.
John Brower, New York.
C. R. Bradbury, Washington, D. C.
Wm. G. R. Braemer, Camden, N. J.
E. L. Baker, New York.
J. Black, Trenton, N. J.
L. K. Barnes, New York.
R. C. Carpenter, Ithaca, N. Y.
Frank K. Chew, New York.
Frank J. Corbett, New York.
George W. Clark, Newark, N. J.
Albert A. Cary, New York.
A. A. Cryer, New York.
John A. Corboy, Chicago.
W. H. Chenowith, Jr., Chicago.
T. B. Cryer, Newark, N. J.
E. F. Capron, Chicago.
James A Donnelly, New York.
M. E. Danforth, Washington, D. C.
George E. Downe, Chicago.
Edward B. Denny, Newark, N. J.
Hugh J. Denny, Newark, N. J.
L. B. Denny, Newark, N. J.
T. M. Dick, Brooklyn.
P. C. Doherty, Poughkeepsie, N. Y.
W. H. Driscoll, Jersey City.
C. A. Dornheim, New York.
Jas. H. Davis, Chicago.
J. E. Edwards, Allentown, Pa.
J. A. Eckart, Brooklyn.
Andrew C. Edgar, Philadelphia.
George B. England, New York.
A. B. Franklin, Boston, Mass.
C. G. Fundinger, New York.
E. C. Fisk, New York.
A. M. Feldman, New York.
Charles K. Foster, Chicago.
Charles H. Fay, Newark, N. J.
George D. Farnham, New York.
Joseph Graham, New York.
Robert L. Gifford, Chicago.
Judson A. Goodrich, New York.
Henry B. Gombers, New York.
James E. Heg, New York.
John F. Hale, Chicago.
Andrew Harvey, Detroit.
Wm. S. Hoffman, New York.
F. E. Hogan, Bolivar, N. Y.
Harry H. Hellerman, Philadelphia.
Harry H. Hess, New York.
E. O. Haskins, Rutherford, N. J.
R. B. Hunt, New York.
W. S. Hemingway, New York.
Frederick B. Ingalls, Syracuse, N. Y.
Stewart A. Jellett, Philadelphia.
August Kehm, Chicago.
Sam Kauffman, St. Louis.
Conway Kiewitz, New York.
C. W. Kragh, New York.
Alfred E. Kenrick, Brookline, Mass.
William Kent, Syracuse, N. Y.
C. V. Kellogg, Chicago.
L. O. Koven, New York.
W. G. Le Compte, New York.
J. S. Lisk, Troy, N. Y.
James Mackay, Chicago.
W. M. Mackay, New York.
F. G. McCann, New York.
C. D. McArthur, New York.
Charles Morrisson, Boston.
Robert Mayo, Jr., Washington, D. C.
Frank Mahony.
A. B. Marshall, New York.
Harry S. Martin, Dunkirk, N. Y.
H. C. Mallory, New York.
Mark E. Monash, New York.
F. J. McPherson, Portland, Ore.
W. W. Macon, Brooklyn.
L. Moore, Portchester, N. Y.
George Mehring, Chicago.
John D. McLarty, New York.
Millard P. Osbourn, Camden, N. J.
G. E. Otis, Oswego, N. Y.
Jarvis S. Otto, Oswego, N. Y.
A. J. O'Neill, New York.
George O'Hanlon, New York.
John A. Payne, Jersey City, N. J.
F. G. Purdy.
G. Petersen, New York.
A. G. Pettelkow, Omaha.
L. H. Quackenboss, New York.
Daniel J. Rice, New York.
P. M. Richards, New York.
C. B. J. Snyder, New York.
William G. Snow, Boston, Mass.
U. G. Scollay, Brooklyn.
Charles C. Scott, New York.
W. R. Stockwell, Irvington, N. Y.
B. F. Stangland, New York.
L. B. Sherman, New York.
L V. Sanford, New York.
F. N. Speller, Pittsburg.
John G. Sutton, San Francisco.
E. R. Stoughton, New York.
P. H. Seward, New York.
C. B. Sisson, Boston.
D. Stewart, Wilkes-Barre, Pa.
T. H. Stevens, New York.
C. H. Seymour, New York.
Fred W. Smith, Dunkirk, N. Y.
Thos. N. Thomson, Scranton, Pa.
Cesar Teran, New York.
Walter Thompson, Jersey City.
W. W. Taylor, Montclair, N. J.
Wilson Van Buren, New York.
Wm. C. Vrooman, Schenectady, N. Y.
C. P. Vanderman, Buffalo, N. Y.
H. A. Wilson, Boston.
Edward P. Waggoner, Jersey City.
H. W. Whitten, New York.
L. J. Wing, New York.
Theo. Weinshank, Indianapolis.
Wiltsie F. Wolfe, Philadelphia.
Warren Webster, Camden, N. J.

After Secretary Mackay had called the roll, President Snyder delivered his address, which contained many important recommendations.

Following are the main portions of Mr. Snyder's address:

President's Address

This society was organized in 1895 by but a handful of men against the advice of fellow-engineers and others who contended that it was not possible that there existed the opportunity for the establishment of another engineering society. The result, however, has been quite the reverse, for the membership now numbers about 350, of which quite a large percentage are in foreign countries.

The hesitation of many men in presenting papers seems to be due to the entirely mistaken idea that a paper to be acceptable and interesting must be replete with geometrical formulas, graphic illustrations and numerous original diagrams. This is all wrong. The lack of proper papers endangers the well-being of the society. The remedy is that the publication committee should be vested with the same plenary powers as are bestowed upon the editor of a newspaper—the power to name the member and subject upon which he is to submit a paper. This power should properly reside in this committee, as it alone is responsible for the publications of the society.

SUCCESS OF WESTERN MEETINGS

The great success attending the semi-annual meeting held in Milwaukee should set at rest the question raised each year as to the advisability of holding them at points somewhat distant from New York. The enthusiasm of our western members and their close attention to the meetings is very encouraging, and gives great promise for the increase of membership by those more recently brought within the sphere of influence of the work of the society.

QUALIFICATIONS OF A HEATING AND VENTILATING ENGINEER

This is the age of education—specialized technical education—the one-thing-best-one-man age, and is growing more intensely so every day. The heating and ventilating engineer has a highly specialized work to perform, and to accomplish this thoroughly and creditably he must not only possess a knowledge of the laws of mechanics but of physics as well; in fact, this latter must really be placed, first if the engineer desires to obtain and hold a high position in his chosen profession.

He must understand most thoroughly the laws governing the generation of heat, the effects of temperature and of humidity, and of the effects of both pure and vitiated air upon the human body. This is necessary before he can bring into play his knowledge of mechanics, the designing of a boiler or furnace which will accomplish a certain result with a minimum consumption of fuel, the transmission of heat to its place of use, the control of the movement of air by mechanical means, and all of the multitude of details of the work which usually are regarded as first when really they are last. Our rapid increase in the density of population of the cities has given rise to entirely new conditions which cannot be met by the continuance of old methods.

NEW CONDITIONS IN SCHOOLS

Members of school boards often forget that not only has the increase in population created new conditions as to restricted light and air for all classes of buildings in our large cities, towns and villages, but that there is also a most radical change in the curriculum of our schools, whereby the large general school room with its limited attendance and the few recitation rooms are no longer in use. Instead, practically the entire school day of a child is spent in one room, and the former class of fifteen or twenty has now grown to one of forty and perhaps sixty pupils. Uniform heating and artificial ventilation, both designed upon scientific principles, therefore become necessities.

NECESSITY OF HUMIDIFYING APPARATUS

The question of humidity in the air supply to buildings under artificial ventilation has been too often side-tracked as not being really essential. Its importance, however, is now being more clearly understood by both engineers and their clients and as soon as the mechanical difficulties in the way can be thoroughly and effectually removed, engineers will no longer hesitate in insisting that it be also included in all installations.

The invention and introduction of numerous new mechanical appliances or devices, together with the rapid improvement of many of the older ones, until they no longer present the old familiar appearance, has fostered the impression among many owners that the tendency was toward the design and introduction of new and complicated devices, and that no longer was the standard of simplicity, ease and economy in operation considered by the designing engineer. In some cases which have come under my observation I think there is some ground for this impression, but on the other hand I have found that changed conditions have created new requirements; such, in fact, that the plant in which simplicity was the chief merit in design would be utterly incapable of filling.

The legislation advocated by this society, following the lead set by the State of Massachusetts, whereby better sanitary conditions are sought to be obtained in the public buildings of various states

has already borne most satisfactory results and no effort should be spared to obtain similar enactments.

President Snyder's address was received with applause and a number of his recommendations were acted upon at the same session.

Secretary William M. Mackay read his report, as follows:

Secretary's Report

Your secretary would report a large increase in membership during the past year. At the last annual meeting our membership was composed of 1 honorary member, 247 members, 20 associates, and 11 juniors, or a total of 279 members of all grades.

During the year, we have added 31 members, 8 associates, and 9 juniors to our roll. One member was re-instated, 1 associate and 3 junior members have been advanced to full membership, 3 members have resigned, and 2 members have been dropped from the roll for nonpayment of dues. Our present membership is, 1 honorary member, 278 members, 27 associates, and 17 juniors, or a total of 323 members of all grades—a net increase of 44.

The financial affairs of the society are in a good condition. At the last annual meeting there was a balance in the hands of the treasurer of $1,794.90. We have received from all sources during the past year, $3,912.41, which, with the balance on hand, made a total of $5,707.31 available. The total expenditures amounted to $3,662.45, leaving a balance in the hands of the treasurer of $2,044.86. There is owing to the society from members for dues, etc., and from newly elected members, for initiation and dues, $915.00. This, with the balance on hand, amounts to $2,959.86. All bills have been paid except those in connection with this meeting. The members dropped from the roll during the past year owed the society $60.00.

The 1906 proceedings have been edited and printed, and will be forwarded to the members as soon after this meeting as they can be received from the binders. The 1907 Proceedings have been edited and will be placed in the printer's hands in the next thirty days in the hope that they may be forwarded to the members before the summer meeting. In connection with the Proceedings, I would mention that we have been very much hampered by not receiving the corrected discussion from the members, we are waiting for two members to return their discussion from the last annual meeting sent out in August, and seven members to return their discussion from the summer meeting sent out in October. This delay in addition to delaying the Proceedings has compelled the ordering of an additional copy of the stenographer's notes so that, in the event of an unnecessary delay or failure to return the corrected discussion on the part of any member, the editor will endeavor to furnish it from the uncorrected copy.

The secretary's expenses for the year, including stenographer, clerk hire, rent of post-office box, certificates, pin badges, expenses in connection with the summer meeting, electrotypes, postage, expressage, telephone calls, office rent, etc., amounted to $1,190.98.

The society held a summer meeting at Milwaukee, Wis., July 18 and 19, 1907, which was successful in every way.

Your secretary sent out over 1,000 letters to the members requesting papers and topics for discussion at this meeting, also a number of special letters to individual members at the request of the board of governors. Papers were promised by some who were unable to find time to prepare them; those that were received and accepted were printed and forwarded to the members and others will be read from manuscript. The reports of two important committees were printed for consideration at this meeting. Respectfully submitted, W. M. Mackay, secretary.

The treasurer's report, read by U. G. Scollay, showed the society to be in a flourishing condition, financially, with a cash balance on hand of $2,044.86.

The report of the Board of Governors was read by James Mackay, vice-chairman of the board, and is as follows:

Report of the Board of Governors

Your board of governors met and organized on January 24, 1907, appointing committees on finance, membership and publication, and an executive committee. The various committees have given careful attention to their duties and the board has met as often as was found necessary during the year. An auditing committee as appointed to examine the treasurer's accounts, which were found correct. This committee made a full and complete report making a number of recommendations, all of which have had careful consideration by the board of governors.

A successful summer meeting was held at Milwaukee, Wis., July 18 and 19, 1907, which fully confirmed the judgment of your board that it will be in the interest of the society and its membership to hold the summer meetings in the west which enables many of our western members who are unable to attend our annual meetings to attend, and take part in these summer meetings, increasing their interest in the society, and increas-

ing our membership in the section in which the meeting is held.

Your board has investigated the desirability of the society's acquiring membership in the National Fire Protective Association and would recommend that the by-laws be so amended as to permit of the society holding membership in this and other kindred associations which will be beneficial to our society.

Mr. Charles W. Newton, of Baltimore, Md., a pioneer heating and ventilating engineer and a charter member of this society, having retired from active practice, on the recommendation of the membership of the society in Baltimore, your board would unanimously recommend that he be made an honorary member of the society at this meeting.

There is a growing demand for back volumes of our proceedings from colleges, libraries, and from our members. Volume 1 is almost exhausted. We have the following number of volumes on hand: Vol. 1, 1895 Proceedings, 9 volumes; Vol. 2, 1896, 32 volumes; Vol. 3, 1897, 127 volumes; Vol. 4, 1898, 147 volumes; Vol. 5, 1899, 119 volumes; Vol. 6, 1900, 123 volumes; Vol. 7, 1901, 147 volumes; Vol. 8, 1902, 108 volumes; Vol. 9, 1903, 160 volumes; Vol. 10, 1904, 150 volumes; Vol. 11, 1905, 168 volumes. A total of 1,290 volumes which at our regular members' price is valued at $6,450.00 or, at their special price, $4,837.50.

Volume 12 will be issued during February, Volume 13 by July; this will bring our proceedings up to date. These proceedings are sold to our members at a stated price with a reduction if six or more volumes are purchased at one time. We have a cut cabinet in which are kept the electrotypes which have been used in our volumes. These would be available in the event of deciding to reproduce any of the volumes.

We have on hand 12 solid gold, and 12 gold plated pin badges. The society has no office furniture or fixtures, that which it is using being furnished by the secretary. Respectfully submitted, C. B. J. SNYDER, chairman; JAMES MACKAY, vice-chairman; WM. G. SNOW, FRANK K. CHEW, R. C. CARPENTER, ALBERT B. FRANKLIN, E. F. CAPRON, R. E. ATKINSON, W. M. MACKAY, secretary.

For the committees, Chairman T. J. Waters of the Compulsory Legislation Committee, sent a letter stating that efforts begun last year to have a ventilating law passed in Illinois would be continued in the next session, and that there was much prospect of success.

A letter was also received from Chairman J. D. Hoffman, of the Committee on Tests, who said that arrangements were being made for some interesting tests, the results of which would be reported at a subsequent meeting.

The Illinois Chapter of the Society, through its secretary, John F. Hale, presented a report showing that the wisdom of forming a local chapter in that section of the country has been more than justified. Mr. Hale said that the Chapter's monthly meetings had been unusually successful and had attracted many non-members as well as the members themselves. A number of the papers read at the Chapter meetings, he said, were worthy of a place in the society's proceedings and would be offered to the society.

President Snyder appointed as tellers for the annual election, Homer Addams, Thomas Barwick and Sam Kauffman.

Under the head of new business was the election to honorary membership of Charles W. Newton, already referred to.

A. B. Franklin, acting on the president's suggestion that the Publication Committee be given power to assign to members subjects on which papers should be written, placed the suggestion in the form of a motion and it was carried.

Another motion, made by J. A. Donnelly, was to the effect that the board of governors devise a form to be used on stationery and business cards to indicate membership in the society. This motion was carried and at a later session an announcement was made that the board had passed on the matter and that members would be notified shortly as to the design that could be used.

EVENING SESSION, JANUARY 21

At the opening of the evening session, Homer Addams, for the tellers, reported the election of the following officers: President, James Mackay, Chicago; first vice-president, James D. Hoffman, Lafayette, Ind.; second vice-president, B. F. Stangland, New York; secretary, William M. Mackay, New York;

treasurer, U. G. Scollay, Brooklyn; board of governors, R. C. Carpenter, Ithaca, N. Y.; C. B. J. Snyder, New York; Frank K. Chew, New York; August Kehm and John F. Hale, both of Chicago.

President Snyder stated that the paper by J. H. Kinealy on the efficiency of cast-iron heaters used in fan blast installations, which was announced in the programme sent to the members, had not been finished by Professor Kinealy in time for the meeting and would probably be presented at the semi-annual meeting. He then called for the report of the committee to collect data on fan blast heating. This report was presented by the chairman of the committee, William G. Snow, and was published in THE HEATING AND VENTILATING MAGAZINE for January, 1908.

How to Use the Harrison Hot Blast Charts

In response to a widespread demand and to enable the reader to more easily follow the discussion of the charts in connection with the report of the fan-blast committee, we reprint herewith the Harrison hot blast charts which first appeared in THE HEATING AND VENTILATING MAGAZINE for October, 1907.

The following example will show how to use the charts:

Suppose a case in which the fan size and delivery have been decided, then the desired velocity of the air through the heater coils is easily fixed with reference to its velocity through the inlet ring of the fan. The free area of the coils being 35% (approximately), the size of the coils may be determined from the velocity of air through them and the amount of air required per minute. To determine the amount of heating surface required to raise the air to the desired temperature and the number of rows of 1-in. pipe in depth of heater, proceed as follows:

Suppose the conditions to be:

Steam pressure to be used gives a temperature of steam of 240° F. Temperature of entering air, minus 10° F. Difference in temperature (steam and air), 250° F.

Desired velocity through coils, 1,000 ft. per min. Temperature desired in heater coils, 140° F. Rise in temperature of the entering air is, therefore, 150° F.

On Chart I find the point corresponding to the difference in temperature between the steam in the coils and the air entering same (250° F.) at the bottom right hand side of the chart. From this point follow vertically with the pencil to the intersecting diagonal line representing 1,000 ft. velocity of air. From this point follow horizontally to the left. Placing a celluloid triangle or scale horizontaly on this line to mark the place, find the desired total rise in temperature of the entering air (in this case 150°) on the scale at the bottom, left hand side of chart. From this point follow upward vertically to the intersection with the horizontal line marked by the triangle. The nearest diagonal from the upper left hand corner of the chart to the above point of intersection will represent the number of rows of 1-in. pipe required in the depth of heater to give the required results, in this case 19 rows, or, say, 20 rows, in order to use standard two or four row heater sections.

In a similar way, Chart II shows the number of B. T. U. given off per square foot of heater coil surface per hour per degree difference of temperature between the steam in the coils and the air entering same, on the basis of coils of 35% free area and having 1.9 sq. ft. of heating surface per superficial square foot of coil area per row of pipe in depth.

DISCUSSION

PRESIDENT SNYDER: Topic No. 1: "Under actual working conditions what is the condensation per square foot in hot blast heaters," and Topic No. 2: "Are there practical working formulæ for figuring the size of steam supply for hot blast heaters," will be considered in connection with the paper just read.

MR. CARY: Referring to the application of air valves the treatment would be very different in different forms of hot blast heaters. There is, of course, a less chance for air binding in the top of "ordinary miter coils two or four rows deep with vertical supply header and horizontal return header." This might account for some of the variation in the replies.

In connection with Question 7: "What is the ratio of free area between the pipes to the 'over-all area' of a section?" I notice 50% is given by two. I have had occasion recently to study the transmission of heat through surfaces and believe that 38% would be the most efficient. Of course it will require a much greater fan pressure as we decrease the area. The heat is transmitted very much more rapidly when a scrubbing action takes place on one or both sides of the transmitting surface. As we decrease the space be-

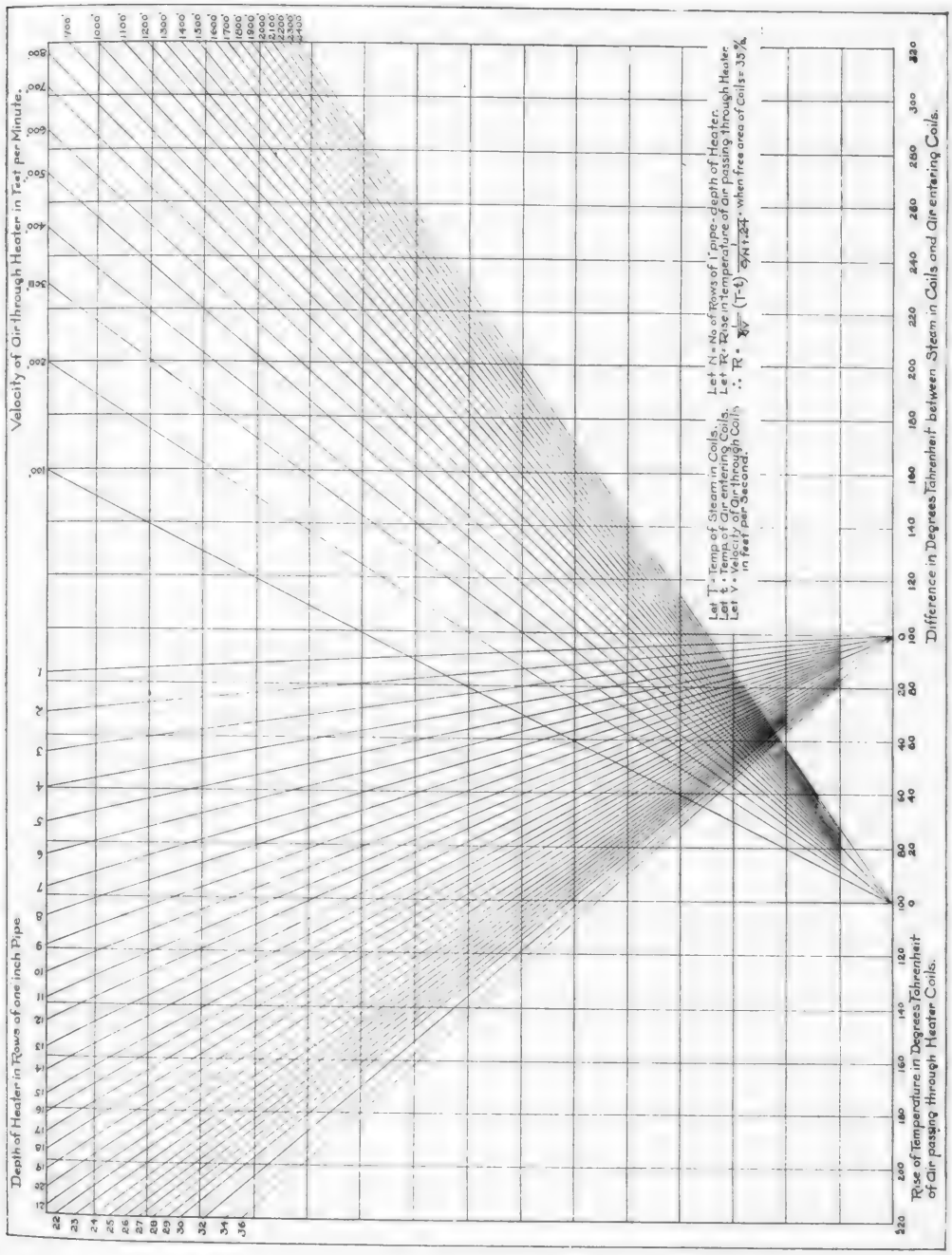

Velocity of Air through Heater in Feet per Minute.
Depth of Heater in Rows of one inch Pipe
Rise of Temperature in Degrees Fahrenheit of Air passing through Heater Coils.
Difference in Degrees Fahrenheit between Steam in Coils and Air entering Coils.
Let T = Temp. of Steam in Coils.
Let t = Temp. of Air entering Coils.
Let V = Velocity of Air through Coils in feet per Second.
Let N = No. of Rows of 1" pipe = depth of Heater.
Let R = Rise in Temperature of Air passing through Heater.
∴ R = V/N (T-t) 1.24 when free area of Coils = 35 %

CHART I—SHOWING RISE IN TEMPERATURE OF AIR PASSING THROUGH BLAST HEATERS, WITH FORMULA
(Reprinted on Reduced Scale from THE HEATING AND VENTILATING MAGAZINE for October, 1907.)

tween the coils we will have more of that scrubbing action. The heating coils in a long, narrow heater are practically more efficient than those in a broader and shorter one.

The velocities given in response to Question 8 are of course only average velocities. The air will seek the passage of least resistance and there will be places where the air velocity is great and at that point will be the greatest transmission of heat.

Referring to Question 11 on the question of blowing or drawing air through the coils, there are two sides to this question. Suction will doubtless give a better distribution of air over the coils, but it is very questionable whether the efficiency of the heating surface will be better. Blowing has a condensing effect, while the drawing of air through these coils has a rarifying effect. Blowing gives more air by weight for the same size than suction. Air after being heated requires a larger fan for the same weight of air. if you were exhausting the same number of cubic feet of air, of course the two fans could be of the same size, but the weight of the air is a very essential factor. The less the weight of air the less the heating capacity.

Regarding Question 12: "How do you determine the maximum temperature obtainable with varying depths of heaters, velocities and steam pressures?" I have tried to find a logical reason for the replies given. In Reply A, one would naturally think that the latent heat in the steam would be in the same proportion to the amount of heat. In other words, the amount of steam condensed at that temperature would be a factor.

The charts given are very interesting. The formula given in Chart I is a remarkable one and I shall be much interested in knowing how this formula was constructed.

Referring to Question 14: "What has been your experience with cast-iron pipe or other indirect radiation besides pipe coils?" Most of these answers, it seems to me, are given concerning cast-iron surfaces. They are not pipes and for that reason it is not so much the metal as it is the disposition of the surfaces which give the variations in the answers. The great trouble in all radiator work in hot water heaters and all places where steam is brought in and rapid condensation takes place, is that there is a great expulsion of air from the steam and the air settles on the surfaces. It is not as atmospheric air, having a ratio of 1 of oxygen to 4 of nitrogen, but there are about 2 parts of oxygen to 4 of nitrogen. The oxygen being very much more soluble in water than the nitrogen, it has, for that reason, a disposition to cling to the surfaces of the heater. Where there is a good presence of air, cast-iron is preferable and better than steel, and wrought-iron comes next to cast-iron.

Concerning Question 17: "Do you regularly make provision for the removal of air from the radiation? If so, where and under what conditions of operation?" Most of us who have had experience, would say "yes" most assuredly. When we come to consider the different forms in which these heating coils are made up, that has a very active bearing upon the answers to this question.

Question 19: "Do you make any addition to or deduction from the amount of radiation, as commonly determined by the rules or formulæ you employ, if any one of the several vacuum systems is attached to the heater?" There is unquestionably a great gain by the use of a proper vacuum system, but the gain is not so much in the lessened surface required as in the lowered temperature of the steam. The real saving in the vacuum system is in the smaller quantities of steam used.

PROF. WM. KENT: Is there a saving of steam in a vacuum system?

MR. CARY: I have had some experience in testing that out. Steam is within the radiator until absolute condensation takes place—no steam allowed to escape. In some vacuum systems a great quantity of steam passes through and there would be greater waste as the latent heat in evaporation is a very important percentage in the total heat of the steam.

PROF. KENT: Suppose we had a heater 20 rows wide and 10 coils deep and another 10 rows wide and 20 coils deep. In the first the air passes through at the rate of 1,000 cu. ft. per min. and through the second, at the rate of 2,000 cu. ft. per min. What would be the difference in heat effect, the same amount of heating surface being used?

MR. WEINSHANK: In the first case the temperature of the air would be about 110°, and in the second case about 145°. With the same amount of air and the same amount of radiation the condensation in the long and narrow heater will be far greater.

MR. DAVIS: Referring to Question No. 14: "What has been your experience with cast-iron pipe or other indirect radiation besides pipe coils?" Concerning condensation, I will read one or two extracts from a report:

CONDENSATION IN CAST-IRON HEATERS

Velocity of Steam in Feet per Minute.	1 sec.	3 sec.	5 sec.	6 sec.
1,600	2.5	2.42	2.16	2.02
1,400	2.5	2.18	1.92	1.79
1,200	2.36	1.93	1.68	1.56
1,000	2.16	1.66	1.42	1.32
800	1.87	1.36	1.15	1.07

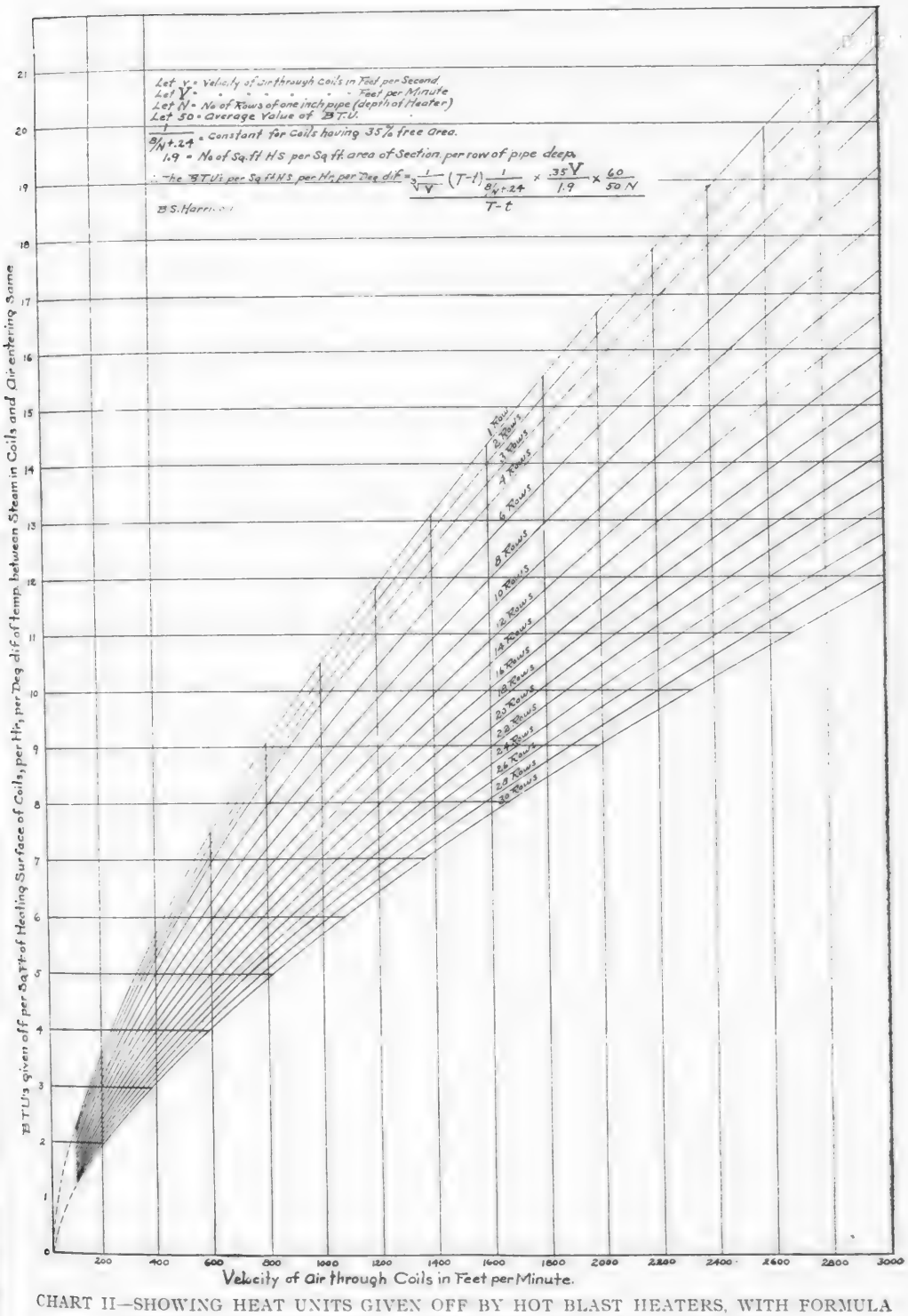


CHART II—SHOWING HEAT UNITS GIVEN OFF BY HOT BLAST HEATERS, WITH FORMULA

(Reprinted from THE HEATING AND VENTILATING MAGAZINE for October, 1907.)

With the temperature raised this was identical with that shown in the report up to seven sections. On eight sections no test has been made. It is to be hoped the committee will inquire into the question of friction.

MR. WEINSHANK: Under Question 1, "those with vertical pipes connected at the top by return bends and at the bottom with a cast-iron base having a vertical partition lengthwise of the base," and Reply 3, "ordinary miter coils two or four rows deep with vertical supply header and horizontal return header." I have heard the remark made that under Reply 3 this form of coil is less apt to air bind than that referred to in Reply 2. My experience has been to the contrary. Those having three turns or three elbows, or two turns, are more apt to air bind than those with return beds.

In answer to Question 11, Reply C says, "we are strongly in favor of drawing through the heater instead of blowing through; in other words, the coils should be placed preferably on the suction side of the fan." I cannot agree with that. If we blow through, that means we are handling air expanded from that of zero to 140°. It is true it will take less power to operate the fan, but with a fan designed to handle, say, 60,000 cu. ft. of air per min., if the air is drawn through, it is only possible to handle 60,000 cu. ft. of air expanded. In addition to this, if we blow through, we are blowing through cold air or air at 60°. We are handling air at 60° blown through the heater and it becomes, say, 130° or 140°, so that we are discharging more air into the building. I have found this difficulty in practice: Where we blow through a heater, a heater set so as to have a by-pass, it is difficult to prevent back-lash, that is, the cold air striking the coils, glancing off and going under the heater, unheated. If proper means are taken to prevent this back lash, blowing through will give better results.

I have made a number of experiments with pipe coils and cast-iron radiation and I got as high as 40° with pipe coils and 55° with cast iron, and with six coils this gives a temperature of 140°, whereas I got 152° and 155° with cast-iron heaters as well as pipe.

In reply to Mr. Cary's question as to how Chart I has been calculated, I will refer him to THE HEATING AND VENTILATING MAGAZINE for November, 1907, in which he will find that explained. The author's name is given and it is explained thoroughly how the formula was gotten up.

In one answer it is stated, "indirect cast-iron pin radiators seem to give fully as high efficiency as pipe coils, but smooth cast-iron pipe does not." I agree with this reply. I was fortunate in being present at a test conducted by Prof. Kinealy where it was found that cast-iron radiation was fully as good, and in one instance a little better than pipe coils.

Where the hot blast is being used in connection with hot water the last design, or cast-iron type, seems to be more satisfactory, because there is only one direction of the flow of water, from the top down or from the bottom up, depending upon the use of gravity or forced circulation.

One manufacturer claims that he removes the air thoroughly by putting in a water seal, stating that the water seal is put in to prevent the steam short circuiting. If he prevents the steam short-circuiting, I do not see how he gets the air out.

Referring to the use of vacuum systems, I do not make any additions or subtractions from the radiating surface when using such systems. I assume that the heating surface I figure on will be effective and, if some positive system is not used, we have a factor of safety allowing for air binding and poor circulation. That is the case in using exhaust steam. If we use high pressure steam we expect a trap to do its work. Where exhaust is used together with a vacuum system we do not use any factor of safety.

MR. DONNELLY: A fan handling air after it is expanded may be driven at a higher velocity with the same amount of power and that question does not seem to have entered into the discussion.

In connection with air removal, speaking of this water seal mentioned in one of the answers, that water seal, as I understand it, is on the drip from the steam chamber and not on the return pipe. There seems to be no good reason why air removal in hot blast radiation should be so much poorer than in direct radiation. It is true the higher rate of condensation and the close proximity of one surface to another probably causes more heat through the return and we all know two-pipe radiators may obtain a flow of steam from the return and where these are set closely to one another this more often occurs than when they are some distance apart.

Where I was consulted recently I suggested that some clause be put in the specifications so that they read as follows: "The hot blast sections must be of such type that the water and air may be removed from the return opening; the type must be such that there will be a natural flow of water and air to the return opening, and competition among hot blast apparatus limited to types of hot blast radiators where air would flow to the return opening." If you use steam of sufficient pressure you

will remove the air at the return opening, the only difference being where you use special devices on the return you do know there is no reentering of steam on the return.

I think the air binding occurs largely in the cold section. One great cause of that is the really higher condensation in the cold section which is more apt to cause a flow of steam through the return.

These specifications said also: If a drip pipe was necessary from the steam chamber that it must be piped separately—through separate devices to the return. The specifications were to be adhered to, irrespective of systems. In other words, the hot blast heaters must be of such a type that there would be an opening where the air naturally would collect. That called for a drip, where necessary. With a miter coil type, a drip would not be necessary.

MR. KAUFMAN: I had a case the other day where in a coil 9 ft. high, with five 4-row sections, the first two rows in the first section were cold; that is, the air one minute would be at the top of the radiator, the next minute in the center and the next on one side. The steam pressure on the coil was two pounds.

MR. DONNELLY: Mr. Kauffman's trouble was caused by a varying amount of steam, flow through the returns into the sections and as it varied so the air took different positions in that section.

MR. WEINSHANK: Replying to Mr. Donnelly's statement that hot blast coils are more apt to air-bind than direct radiation, we all know that air has a specific gravity greater than steam and when air enters the radiator or coil, it is at the bottom and will stay there as long as the steam is uncondensed, but the minute it is condensed, the air has to go to the top and that is why we put the vent at the top. But if there are mechanical means of removing this air as soon as it enters the base there will be no air to bind the radiator.

MR. SNOW: In running over Chart II I am interested to find confirmation of it in my own practice. Following up the 1,000 ft. velocity line, at the base of the chart, until it intersects the line marked "10 rows" that intersection carried to the left lands you at about 8½ points. That means that 8½ heat units are given off per square foot of heating surface of coils per hour per degree difference of temperature between steam in coils and air entering same. That is, 8½ x 228°, for example, gives 1,938 heat units of coil radiation per hour, with a flow of 1,000 feet. I have been in the habit of using, in a number of cases, the figure 2,000, which means square feet of blast coil under these conditions gives off eight times as much heat as square feet of ordinary direct radiating surface in a room.

To get at the amount of coil surface required, 30,000 cu. ft. of air per min. x 60 min. x 70° rise, all divided by 50 cu. ft. of air at 1 x 2,000 heat units, equals 1,260 sq. ft. x 3, or 3,780 lineal feet of 1-in. pipe. I call your attention to the fact that the 2,000 heat units is borne out by the Chart II, which I consider a very interesting and valuable one.

MR. WEINSHANK: Is it not a fact that with a fan of that capacity you would use 4 x 520 lineal feet instead of 3,780?

MR. SNOW: Every heating man here has had sometimes to put in more surface than the heating laws require in order to give the necessary area for the air flow. Frequently we come out with certain figures and we wish to get the velocity down to 1,000 feet, but have to put in more pipes to get that low velocity of flow. I have found that 2,000 figure applies pretty closely.

MR. BARWICK: Did you use the tempering coils?

MR. SNOW: I generally figure on 75°. I have found where we had systems drawing air 300 or 400 feet, perhaps more, there would be a drop in temperature.

MR. WEINSHANK: If what Mr. Snow refers to is air tempered before used in the heater, I do not agree with Mr. Snow. The manufacturers will say that 60° in the tempered air chamber is better than 65° and that 70° is out of the question.

I had an experience in Evansville, Ind., in a school-house, where, owing to the back-lash, as I stated before, too much hot air went under the hot air chamber and the temperature went up to 75°. We could not get any regulation until we provided an apron in front of the heaters and reduced the temperature to 60°.

MR. SNOW: A good many heat calculations are based on rather small margins of safety or no margin at all. 70° gives you a little margin. You have the capacity there if you wish to use it, and if you want to run below 60°, it is a small matter to control that.

MR. BARWICK: I would like to hear something as to the efficiency of the disc fan as compared with the ordinary fan.

MR. WEINSHANK: You can compare the disc fan with a boat. Which of the boats is the more powerful, the side wheeler or the screw propeller? You would say the side wheeler is the more powerful, but the reason we use the screw propeller is because the waves do not interfere with it. A disc fan will not work against pressure. If you are called upon to use the fan with a certain amount of back pressure, the loss through the disc fan is so great it will not deliver within 50% of what it is

designed for. The disc fan is only good where you deliver air to the atmosphere. If you have a large room and want to draw the air out of the room, it will do good work. Of course, it is understood a disc fan at the center does not draw in air; only at the ends of the blades. If you are called upon to discharge air into a duct or against coils or against any pressure, their efficiency is very low. In addition, if you want to increase the speed of the fan, the greater the speed of the disc fan, the lower its efficiency.

(On motion of Mr. Barron it was voted to continue the committee to collect data on fan-blast heating.)

MR. CHEW: Mr. England has brought to this meeting a number of charts relative to steam heating work done in New York City and he has, in addition, an air-testing apparatus which those interested may see.

AFTERNOON SESSION, JAN. 23

In the absence of President Snyder, Vice-President James Mackay took the chair. The report of the Committee to Collect Data on Hot Water Heating for Residences was then read and is presented herewith:

Report of Committee to Secure Data on Hot-Water Heating*

After three preliminary reports to the society, in which were submitted, first, a plan of procedure; second, replies to questions sent out; third, the result of tests made, the committee begs leave to submit as a final report the accompanying notes, which are from the following sources:

Text-books and publications of prominent engineers.

Practice of engineers and contractors as shown by some sixty replies to letters asking for data.

Experience of and tests secured by the committee.

Study and comparison of trade catalogues and information given by manufacturers.

Direct Radiation

The best practice calls for the use of the heat unit as a basis for computing the amount of radiation required.

The heat lost through surfaces exposed to cold may be found by using the above multipliers. The result should be increased by 30% as an allowance for leakage; or in rooms with three or four sides exposed, the leakage may be assumed as ordinarily not exceeding one change of air per hour, and the B. T. U. lost in this way may be determined as follows:

$$C \times T \div 55 = \text{B. T. U.}$$

C = contents of room; T = temperature desired.

Fifty-five is approximately the number of cubic feet of air raised one degree by one B. T. U.

The glass area should be deducted from the exposed wall area before multiplying. The table is for southern exposure. Additions should further be made as follows:

North, 30%; east, 10%; west, 20%.

This addition is for the increased transmission of heat due to wind, and must be used with judgment and con-

*Presented at the January, 1908, meeting of the American Society of Heating and Ventilating Engineers.

TABLE A

Within the ordinary range of temperature, the losses in B. T. U. per sq. ft. per hour through various substances, as given below, seem to be conservative.

Temperature outside	40	30	20	10	0	—10	—20
Temperature inside	70	70	70	70	70	70	70
8-inch brick wall	13	18	22	27	31	35	40
12-inch brick wall	10	13	16	20	23	25	30
16-inch brick wall	8	10	13	16	19	22	24
20-inch brick wall	7	9	11	14	16	18	20
24-inch brick wall	6	8	10	12	14	16	18
Single window	56	49	66	73	85	93	105
Double window	24	32	40	48	56	62	70
Single skylight	31	42	52	63	73	84	94
8-inch frame house wall plastered inside	8	10	13	16	19	22	24
Cold ceiling or floor areas	5	6	8	10	11	13	15

sideration of the locality of the building.

The total B. T. U. as obtained above, after additions for leakage and exposure have been made, is to be divided by 150 for hot-water heating, as this is a conservative estimate of the amount of heat given off per hour by one square foot of ordinary cast-iron radiation with the room at 70° and the water at an average temperature of 170°. The quotient is the amount of direct radiation needed.

Indirect Radiation

The amount of indirect radiation required may be worked out by assuming the following:

The values shown in parenthesis are probably correct with indirect hot water.

Temperature of the air entering the room (110°).

Average temperature of the air passing through the radiator (55°).

Temperature of the air leaving the room (70°).

Velocity of the air passing through the radiator (240 feet per minute).

Having found the loss of heat by exposure, to find the cubic feet of air necessary to carry this to the room at the given temperature:

$H \times 55 \div (T-t)$ = cubic feet of air per hour.

H = exposure loss in B. T. U. per hour; T = temperature of the air entering the room; t = temperature of the air leaving the room.

Given this volume of air to find the heat necessary to raise it to the entering temperature:

$$T \times C \div 55 = \text{Heat.}$$

T = temperature required; C = cubic feet per hour.

The amount of radiation is found by dividing the total heat by the efficiency of the radiation at the velocity and temperature difference assumed.

The difference between 170° (average temperature of the water in the radiator) and 55° (average temperature of the air in the radiator) being 115, the efficiency at 240 feet velocity per minute is 2. per degree difference or 230 B. T. U.

TABLE B

The following table gives the emission of heat by indirect radiators per square foot per hour per degree difference in temperature:

Velocity of Air in Feet per Minute	B. T. U.
174	1.70
246	2.00
300	2.22
342	2.38
378	2.52
400	2.60
428	2.67
450	2.72
474	2.76
492	2.80

Ordinarily the amount of indirect radiation required is computed by adding a percentage to the amount of direct radiation, and an addition of 50% has been found sufficient in many cases; but in buildings where a standard of ventilation is to be maintained, the above formula seems more likely to give satisfactory results. Free area between the sections of radiation to allow passage of the required volume of air at the assumed velocity must be carefully maintained. The cold-air supply duct, on account of less frictional resistance, may ordinarily have 80% of the area between the radiator sections.

Boilers

Many boilers for residence heating are not rated satisfactorily in the catalogues. Among twelve familiar types the hot-water rating for the same grate surface varies from 2,800 to 3,875 sq. ft. The amount of fire surface is not generally published and information is difficult to obtain. It probably varies 50% among these same twelve types.

Given proper combustion and sufficient length of fire travel to prevent excessive draft, the amount of heating surface is apparently not a prime factor, as boilers with large combustion chambers and comparatively small heating surface have surpassed the performances of other boilers of the same type and grate area with small combustion chambers and large heating surface.

A restricted combustion chamber is kept at rather a low temperature by the proximity of the water-cooled sur-

faces and the high temperature of good combustion is difficult to obtain. As a rule, the longer and higher the fire-box the better the combustion. Apparently 8,000 B. T. U. per lb. of coal is a conservative average estimate of the heat transmitted to the water in a well-designed boiler, after allowances for various causes commonly affecting the efficiency have been made. Hard coal usually gives off more heat per pound than soft coal, but on account of the more rapid combustion of soft coal the final results of the two fuels about balance. Thus, if we divide the heat given off per hour by the radiation and piping by the effective value of the coal, we have an estimate of the pounds of coal that must be burned per hour.

The grate surface to be provided depends on the rate of combustion, and this in turn depends on the attendance and draft, and on the size of the boiler. Small boilers are usually proportioned with a small amount of fire surface per unit of grate, and thus are adapted for intermittent attention and a slow rate of combustion. The larger the boiler, the more attention is given to it, and the more heating surface is provided per square foot of grate. The following rates of combustion are common for internallyly fired heating boilers:

TABLE C

Sq. Ft. of Grate	Pounds of Coal per Sq. Ft. per Hour
4 to 8	Not exceeding 4 pounds
10 to 18	Not exceeding 6 pounds
20 to 30	Not exceeding 10 pounds

The number of pounds of coal to be burned per hour divided by the rate of combustion indicates the size of the grate required.

It is desirable so to proportion residence boilers that attention need ordinarily be given them only about once every eight hours. The fire-box should be sufficiently large to hold this amount of coal with its attendant ash and clinker and still leave ample room for the mixture of the products of combustion.

Multiplying the amount of coal required per hour by the number of hours intervening between replenishments and adding 20% for ash and clinkers gives a conservative estimate of the number of pounds of coal to be accommodated. This divided by 50, the number of pounds of ordinary coal in one cubic foot, gives the space occupied by the fuel. As this should not exceed about one-third of the total height of the fire-box for soft coal, this sum multiplied by three gives the fire-box capacity in cubic feet for soft coal. Multiplying the fuel space by two is believed to give ample combustion space for hard coal. Combustion must be completed in the fire-box of the ordinary boiler or it is never completed. The flues are merely economizers acting to cool down the products of the combustion before entering the chimney.

Piping

The average sizes of mains, as used by seven prominent engineers in regular practice for 1,800 square feet of radiation, are given below:

2 pipe open tank system, 100 ft. mains 5 in. pipe = 26.6 ft. velocity per minute
1 pipe open tank system, 100 ft. mains 6 in. pipe = 18.4 ft. velocity per minute
Overhead open tank system, 100 ft. mains 4 in. pipe = 41.8 ft. velocity per minute
Overhead open tank system, 100 ft. mains 3 in. pipe = 72.1 ft. velocity per minute

For 1,200 square feet indirect radiation with separate main, 100 feet long, direct from boiler, open system, the bottom of the boiler being 1′ 0″ above the top of boiler—5″ pipe = 22.4 feet velocity per minute.

The above velocities are calculated as follows:

$$R \times X \div (20 \times 60.8 \times 60) = \text{cu. ft. of water per minute.}$$

R = sq. ft. of radiation; X = B. T. U. given off per hour by 1 sq. ft. of radiation (150 for direct and 230 for indirect) with water at 170°. Twenty is the drop in temperature in degrees between the water entering the radiation and that leaving it: 60.8 is the weight of a cubic foot of water at 170°: 60 is to reduce the result from hours to minutes.

The following is taken from "Principles of Heating," by Wm. G. Snow:

"If the volume of water passing through pipes of different sizes is

known, the radiating surface they will supply may be readily computed. With the same drop in temperature in radiators, the force causing circulation will be alike in all. With pipes of equal length, the resistance will vary, as the square of the velocity and inversely as for the diameter expressed as $V^2 \div d$. Now, if we assume, for example, that a 2-inch pipe will supply 200 square feet of direct radiation, which in practice it will readily do, and compute the value of $V^2 \div d$ then make $V^2 \div d$ the same for pipes of other sizes, a table may be prepared showing the radiating surface that may be supplied by pipes of different diameters when working under the same conditions, with respect to the head causing the flow and the resistance to the circulation."

As the velocities stated agree with the practice of the seven engineers above tabulated for a two-pipe open system, the following table has been prepared, using Mr. Snow's table as a basis, and changing the amounts of radiation supplied under other conditions in proportion as these given by him vary for other sizes of pipe. The amount used as a base in each column is in heavy type.

The capacities of risers for different floors, from data obtained from nine engineers, in the same manner, agree almost exactly with Mr. Snow's table given above for an open tank system: The table for an overhead closed tank system is proportional to Mr. Snow's table for mains, using as a basis 300 square feet of radiation on a 2-inch riser.

TABLE D.

The capacity of mains 100 ft. long, expressed in the number of square feet of hot-water radiating surface they will supply, the radiators being placed in rooms at 70° Fahr., and 20° drop being assumed.

Diameter of Pipes.	Two-Pipe up Feed Open Tank.	One-Pipe up Feed Open Tank.	Overhead Open Tank.	Overhead Closed Tank.	Two-Pipe Open Tank.
Inches.	Direct Radiation.	Direct Radiation.	Direct Radiation.	Direct Radiation.	Indirect, 12 inches above boiler.
1¼	75	45	127	250	48
1½	107	65	181	335	69
2	**200**	121	339	667	129
2½	314	190	**533**	1,060	202
3	540	328	916	**1,800**	348
3½	780	474	1,334	2,600	502
4	1,060	645	**1,800**	3,350	684
5	1,860	1,130	3,150	6,200	**1,200**
6	2,960	**1,800**	5,000	9,800	1,910
7	4,280	2,700	7,200	13,900	2,760
8	5,850	3,500	9,900	19,500	3,778

TABLE E.

The capacity of risers expressed in the number of square feet of direct hot water radiating surface, they will supply the radiators being placed in rooms at 70° Fahr. and 20° drop being assumed:

Diameter of Riser.	Open Tank System.				Closed Tank Overhead System.
Inches.	1st Floor.	2nd Floor.	3rd Floor.	4th Floor.	Drop risers, not exceeding 4 floors.
1	**33**	46	57	64	48
1¼	71	104	124	142	112
1½	100	140	175	200	160
2	187	262	325	375	300
2½	292	410	492	580	471
3	500	755	875	1,000	810

Inasmuch as radiators are commonly tapped 1 in. up to 40 sq. ft., 1¼ in. from 40 to 72 sq. ft., and 1½ in. for larger than 72 sq. ft., little is to be said about the size of radiator connections. One prominent engineer states that with one pipe overhead circulation he has never found a radiator so large that 1½-in. connection would not supply it.

Another states that he has been using with perfect satisfaction special radiator tappings side by side at the bottom of one end of each radiator. This results in economy of installation and a neater appearance of the work.

JAS. MACKAY, Chairman.
E. F. CAPRON.
S. R. LEWIS.
Committee on Hot-water Heating.

DISCUSSION

MR. CARY: Looking at the formula showing what is necessary with a change of air in a room, $C \times T \div 55 =$ B. T. U.—in other words, the contents of the room multiplied by the temperature desired $C \times T$. Should this large T not be T—t? If the temperature is zero, this formula will be right, but it is a question whether that is the one used, especially in the northern parts of the country.

I have taken the matter given in the beginning of the report and put it in a formula which I think is very much handier for reference, and in considering the problems, we have each letter with its equivalent one letter after the other, substituting the values given:

$$[(W + w + s + f)\,1\frac{c(T-t)}{150}]\,E = R.$$

W—wall. w—window. s—skylight. f—cold floors and ceiling. l—leakage. R—radiating surface. In Table A, for instance, we can run through the table and find out the value for each item.

The matter of rating heating boilers by boiler manufacturers is most absurd. It is true, however, that the disposition of heating surface has a great deal to do with rating. In large boiler installations, where I have made some very careful determinations, taking, for instance, the horizontal tubular boiler, as a general thing, 60% of the total heat absorbed by that boiler is absorbed during the first run of gases from the fire box back underneath the boiler. In water tube boilers, the value of the first run of gases up through the tubes is 80% of the work done in the boiler. It is very necessary to look to the disposition of the heating gases immediately after leaving the fire box.

MR. BARRON: Prominent boiler manufacturers will not give the actual heating surface of their boilers.

MR. CAPRON: I agree with Mr. Barron on the rating of boilers. The manufacturers seem to hesitate to give the amount of fire surface and we are unable to obtain it. Regarding the 2-in. pipe and amount of radiation, we wanted to be conservative in this report.

MR. JAS. MACKAY: I maintain that the sectional boiler has as much heating surface as any boiler upon the market, foot for foot. The water tube boiler has a great deal less heating surface than the tubular boiler. The sectional boiler is largely of the nature of the water-tube boiler. The manufacturers, I believe, all stand ready to give the heating surface when it is asked for.

MR. QUAY: The society would not be much benefited to take the ratings of the majority of manufacturers unless they defined what they meant by heating surface.

MR. KAUFMAN: Is it not a fact that one manufacturer of cast-iron boilers last year cut out about one-third of the heating surface from the boiler and increased its rating about 20%?

MR. JAS. MACKAY: They possibly had an overabundance of heating surface to start with.

MR. PETTELKOW: The manufacturers in question found they had an overabundance of what I should call "indirect heating surface" and not enough "direct."

Answering the gentleman who said boiler manufacturers should sell boilers rather by the amount of heating surface that they contain, I cannot see that point very well. One square foot of heating surface in a tubular boiler will not do what one square foot in a safety boiler will do. If you want a 150 horse power safety tubular boiler, you know the manufacturer will sell you a boiler that will furnish you 150 horse power and that boiler will contain less heating surface than a tubular boiler of the same size. The tubular boiler will contain less surface than the fire-box boiler. The same principle applies to cast-iron or sectional boilers.

MR. CARY: I have drawn specifications for many thousands of horse power and in power boilers, whether they are horizontal tubular boilers or water-tube boilers or any other type, I have found the heating surface the only safe basis to proceed on. Some years ago, it was frequently specified in large power boilers that so many horse power were required, but it was found the different boiler manufacturers supplied many different ratings. For in-

stance, one boiler manufacturer said 7.5 sq. ft. of surface was as good as 11.5 sq. ft. of surface in another boiler. The horse power basis is gradually dropping into disuse.

The value of different parts of heating surface in boilers is determined very easily. The law of transmission, generally speaking, is that the transmission is proportionate to the difference in temperature, not directly but as the square of the difference in temperature between the two sides of the transmitting surface. The method clung to by manufacturers of boilers of selling boilers upon their radiation capacity is one that obscures the real value of the boilers. We are beginning to know what the fan blower people are doing and we are beginning to be able to figure the thing out for ourselves and find out what the true value of a blower is.

I think the same thing should be brought about in connection with heating boilers.

SECRETARY MACKAY: In the consideration of cast-iron boilers, there is hardly a manufacturer who does not know how many square feet of radiation he has in his boiler, and how many square feet of fire surface and the majority, if not all of them, have rated their boilers either from grate area, or fire and flue surface, in heating units, and from that transferred it into square feet of radiating surface which it would average under ordinary conditions. While the assertion has been made here that no manufacturer has published the surfaces in his boiler, I know of many who have done and are doing it and many of the specifications that are written to-day state that a house heating boiler has got to have so many square feet of grate area or so many square feet of surface.

PROF. KENT: I have been reading the transactions of different engineering societies for the last 25 years and this is the first time I ever heard of such a thing as a manufacturer suppressing figures regarding the amount of heating surface in his boilers, or giving them to the engineers and refusing them to the public. I think it is altogether contrary to American practice generally to say there is any set of people in America to whom it is dangerous to give engineering information.

MR. BARRON: There is no published information on the heating surface of boilers. We cannot take the manufacturers' catalogue, as we can that of the power boiler manufacturers, and say such and such a boiler has so many square feet of heating surface.

MR. CHEW: Shall we recommend this to the publication committee to select a man to write us a paper and illustrate it with the different types of house heating boilers in common use, or should we, as done before, appoint a committee on the subject?

MR. D. M. QUAY: I am of the opinion that we want to continue the committee appointed to get all the information they can.

SECRETARY MACKAY: Some three years ago the ratings of house heating boilers was taken up and Prof. Kent took from a manufacturer's catalogue and spread upon the blackboard the amount of surface, the amount of grate area and other figures from the catalogue and then figured how the boilers should be rated and he agreed closely with the figures he took from the manufacturer's catalogue. This information will be found in our proceedings.

MR. CARY: There seems to be an idea that the transmission of heat from burning fuel to make steam in a power boiler is very different from the transmission of heat from fuel and water for heating purposes. There is no difference.

In the case of power plants, the manufacturer says we supply so many square feet of heating surface per horse power. There is no reason why, in the case of the manufacturers of house heating boilers, that same statement cannot be made.

MR. QUAY: I move that a committee of three or five be appointed to take up the question of heating surface of boilers and report at the next meeting.

(Mr. Quay's motion was passed.)

MR. MCARTHUR: Referring to Table A in the report, the factors for the 16-in. brick wall seem to be too low. In actual practice they should be for walls between 8-in. and 12-in. In zero weather it is 19 for the 16-in. brick wall. In my practice I have found 28 or even 39 would give better results.

I believe that on the whole 75% of the buildings and we might say 50% outside of New York, are heated with hot water boilers. I think, even allowing for losses of 30%, which accounts for leakage, adding 30 for northern exposure is piling up the percentage a little too much.

With an 8-in. frame house wall, between 8-in. and 12-in., if we made it about 28 it would be nearer right. Of course, the 12-in. wall or the 16-in. brick wall, having been there for five or twenty years, is a better non-conductor of heat than when freshly built, and the walls are in better repair than those of a frame house. A frame house in two or three years will shrink and the air-leaks through an 8-in. frame wall is something marvelous.

(Continued on Page 36)

THE NEW ALTMAN BUILDING, NEW YORK

Heating and Ventilating a Modern Department Store

Mechanical Equipment of B. Altman & Co.'s New Building, New York

By John G. Eadie

The new Altman building occupies the block fronting on Fifth avenue, between Thirty-fourth and Thirty-fifth streets, New York City, and extends back three-fourths of the way to Madison avenue. The dimensions of the plot are approximately 200 ft. x 300 ft., with a lot 20 ft. x 100 ft. on the Thirty-fourth street corner, cut out for the present.

The building is eight stories high, with the roof 150 ft. above the curb. There is a basement under the entire building and sidewalks, and a sub-basement under the easterly half. The latter is 40 ft. below curb, and was blasted out of solid rock. The first, second, third and fourth stories are the selling floors and have high ceilings: 20 ft., 16 ft., 15 ft. and 14 ft. in the clear, respectively. The upper four floors are for stock rooms and the making of garments, etc.

A central court, 60 ft. square, furnishes light and air to the interior of the four upper floor and light to the lower stories through a rotunda open down to the first floor. At the fifth floor level, at the top of this rotunda, and separating it from the court above, is an ornamental glass dome with openings around the base to permit the escape of air which rises through the rotunda during the heating season. A glass covering raised above the roof high enough to provide for the circulation of air under it keeps snow out of the upper court.

The building faces west on Fifth avenue, where the main entrance is located. Customers may also enter through a vestibule near the middle of the building on Thirty-fourth and Thirty-fifth streets. The passenger elevator shafts and stairways are placed on these two latter sides, while those for freight and service are in the rear. The partitions dividing these latter from the main floors are practically the only partitions in the en-

VIEW IN BOILER ROOM, NEW ALTMAN BUILDING

tire building, extending from floor to ceiling, the few others are low ones. This leaves each story one big open room.

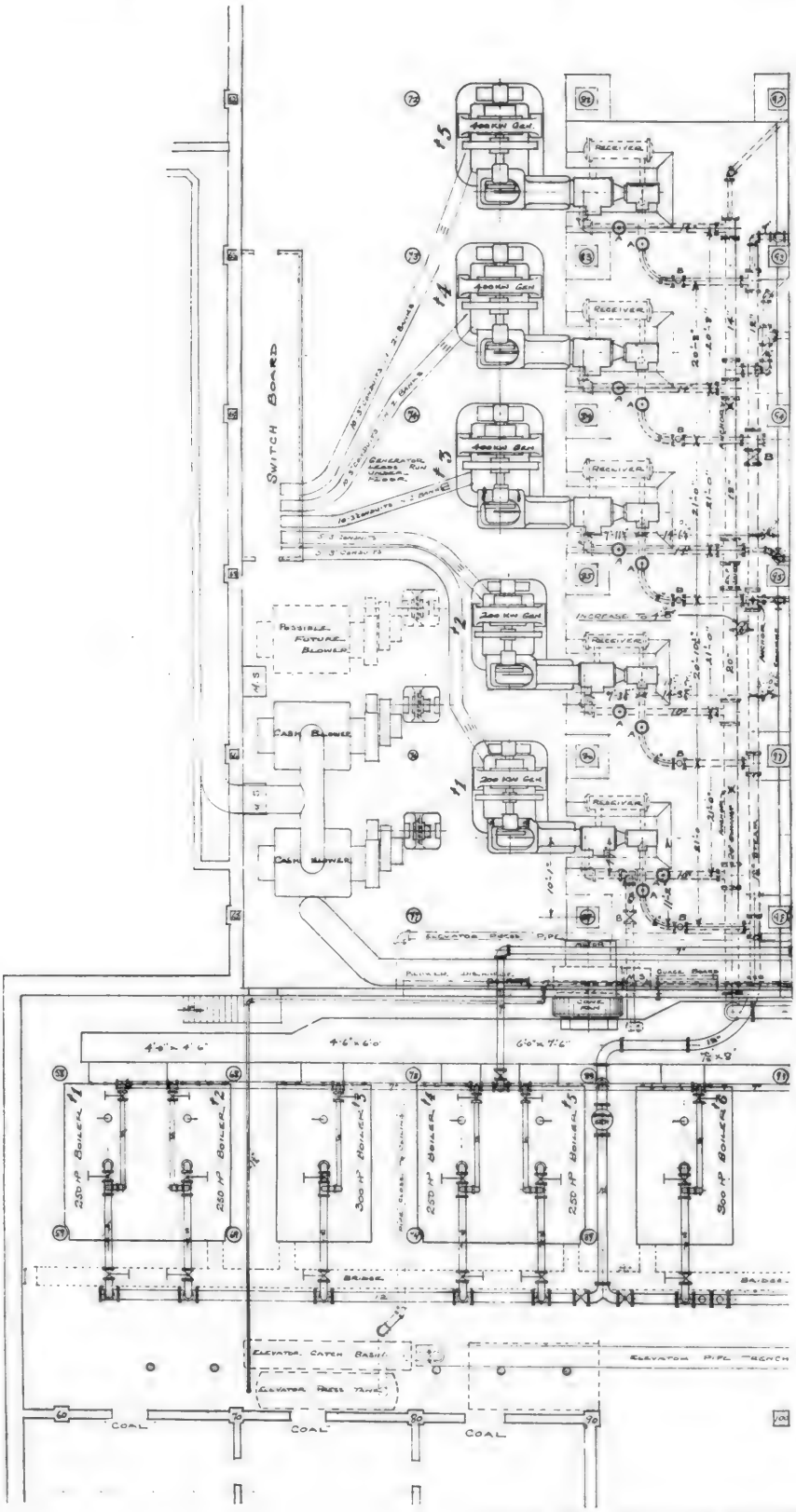
UNUSUALLY LARGE GLASS SURFACES

Another important feature of the building from the standpoint of heating and ventilation is the large glass surface, the windows forming a good part of the wall area, and having sills only two feet above the floor. In the second story they come down almost to the floor.

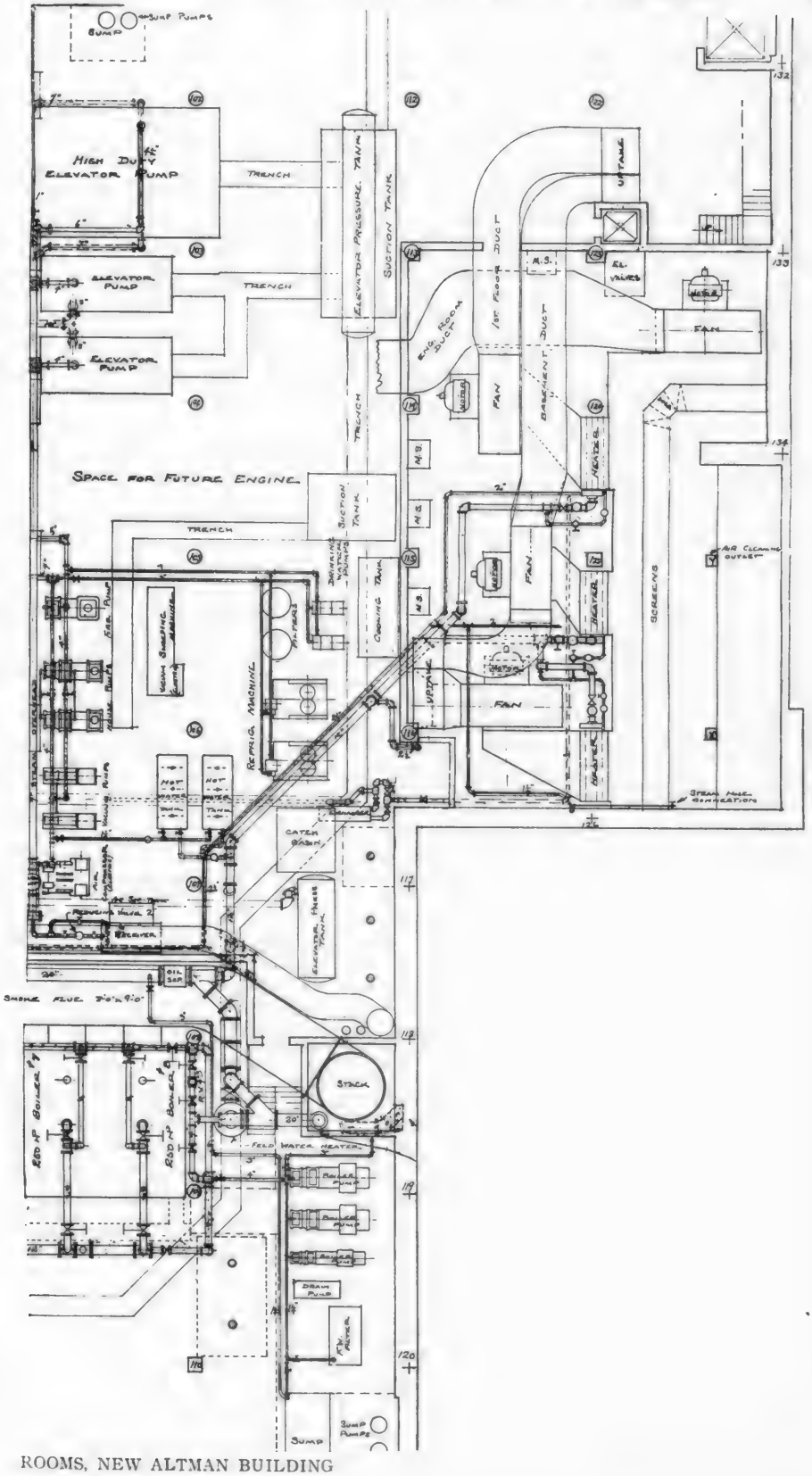
The total cubic contents of the building is 8,500,000 cu. ft., and the eight floors, excluding courts, have a combined area of 520,000 sq. ft.

Because of the crowds of people which occupy the first floor at certain seasons of the year, it was decided to use forced ventilation and indirect heating for this story, also to treat the basement and sub-basement in the same way to insure

VIEW IN ENGINE ROOM, SHOWING FRESH AIR SUPPLY AND EXHAUST DUCTS



PLAN OF ENGINE AND BOILER



ROOMS, NEW ALTMAN BUILDING

a proper circulation of air. For the upper floors, direct radiation was adopted because natural ventilation was considered sufficient for the number of people occupying them. Also because of the value of the space the ducts for delivering heated air would occupy, and because of the lower operating cost of the direct system.

STEAM HEAT USED

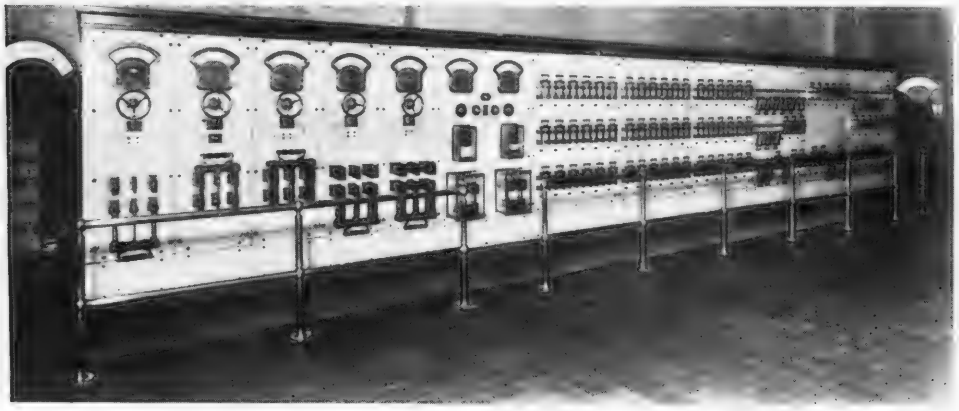
Steam was adopted in preference to hot water on account of its lower first cost and smaller amount of radiating surface, and less complication of apparatus. In this case the heating system was worked out in connection with a private plant for supplying light and power for elevators, pneumatic tubes, vacuum sweeping, refrigerating machine, pumping water, and motors for manufacturing, etc. The private plant was adopted rather than street service after a thorough investigation, because it was found that a large private plant of similar size was producing electricity for less than 1½ cents per kilowatt hour, including fixed and maintenance charges, while the lowest rate offered by the N. Y. Edison Co. was 2½c., a difference of over $20,000 a year on the quantity required.

In designing the plant it was necessary to know what the greatest and average loads would be, and how much steam would be required for heating. The answer to this latter question was determined from the coal required to heat other buildings of a similar character, and was estimated to be 25,000 lbs. of steam per hour as a maximum with an average of about 17,000 lbs. per hour in cold weather.

METHOD OF ESTIMATING LOAD

To get at the probable load the plant must carry, figures were obtained from a number of buildings used for a similar purpose, giving the hourly requirements for power, coal, and water for many consecutive days in different seasons of the year. From these figures load curves were plotted, due allowance being made for factors peculiar to this building. The figures thus obtained showed that there would, at all times, be enough exhaust steam for heating and much of the time a great deal more than enough. This fact made it necessary to design the plant for economy in steam consumption and for this reason moderately high steam pressure and compound engines were selected. These are of the medium speed Corliss valve type, direct connected to dynamos; there being three 400 KW. and two 200 KW. sets, with 25% overload capacity for two hours.

The boiler pressure was fixed at 150 lbs., as, owing to lack of cheap condensing water and to the requirements of steam for heating, it was not advisable to run condensing. The use of a cooling tower was considered, but the interest on the investment and cost of operation of tower, condenser and pumps and piping offset any advantage to be gained in condensing the steam not needed for heating.



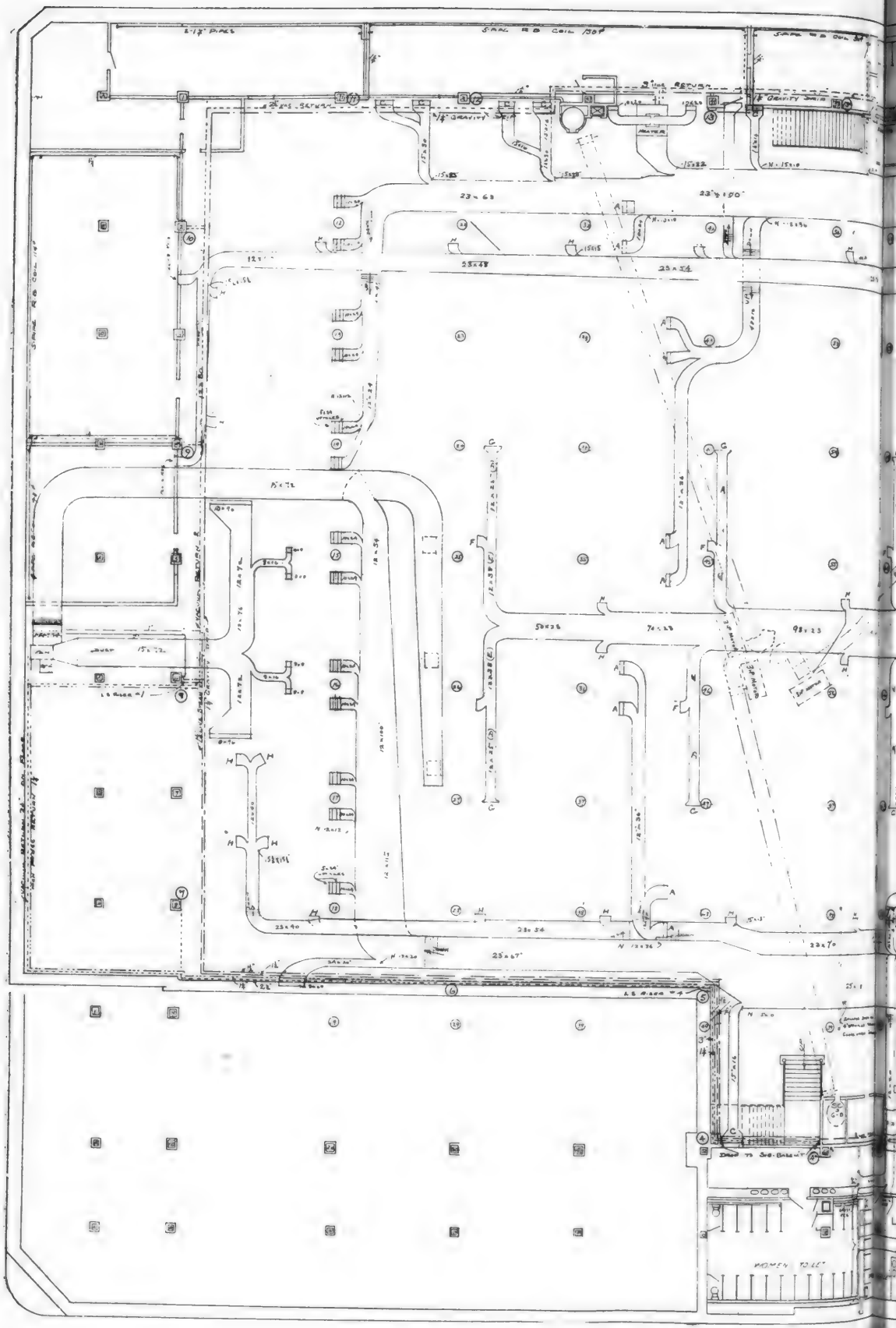
ELECTRIC SWITCHBOARD IN ENGINE ROOM, NEW ALTMAN BUILDING

An economical type of steam driven elevator pump with Corliss valves was selected for supplying the hydraulic plunger elevators. Two smaller elevator pumps of compound direct-acting duplex type were provided for emergencies. The other pumps, house, fire, and boiler feed were of this type.

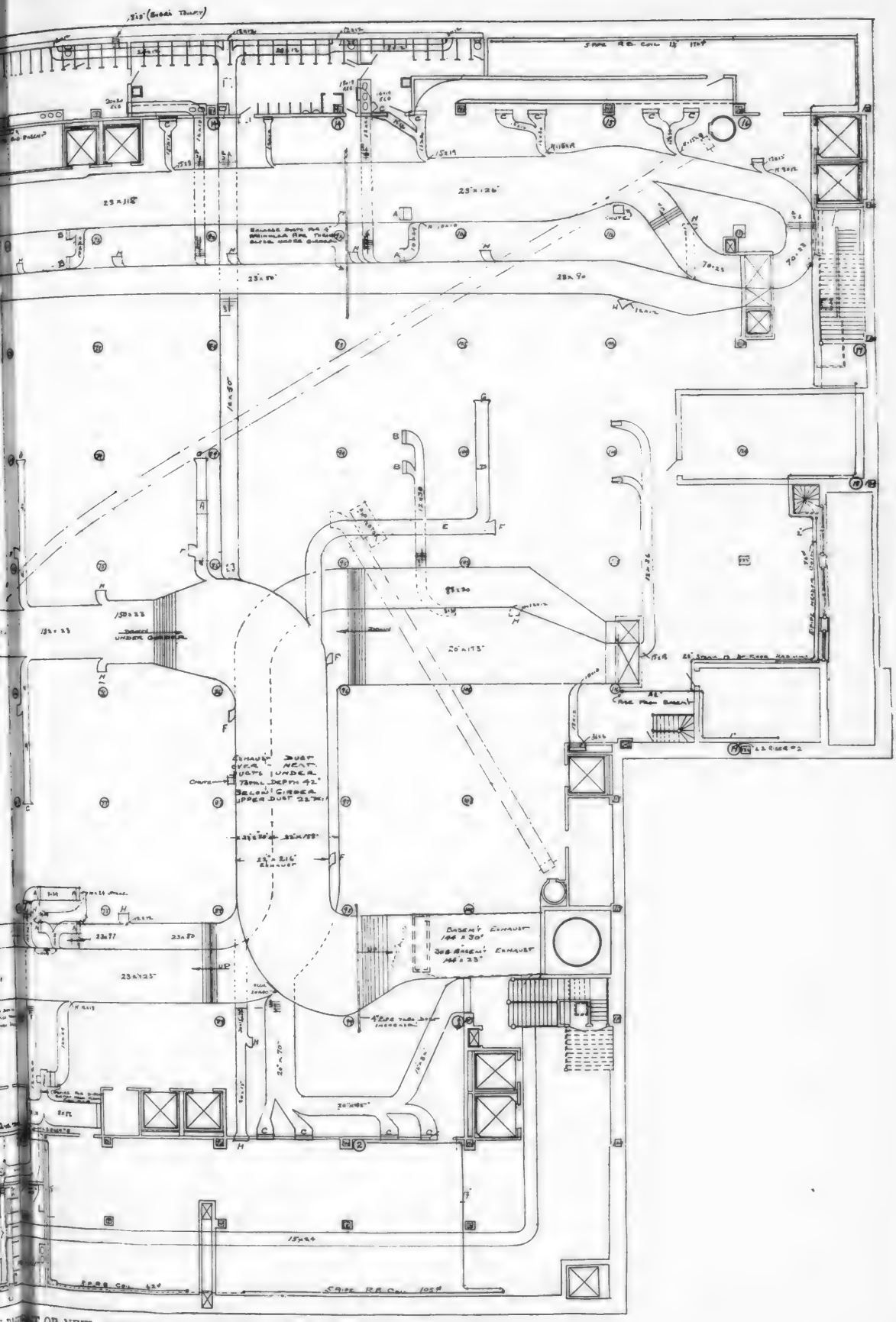
Economy in coal consumption being always in order whether the engines are used as pressure reducing valves for steam going to the heating system or not, grates of boilers were proportioned for the use of small sized cheap grades of coal. The necessary capacity of boilers was figured to be 2,100 horsepower, and owing to the spacing of the building columns, the best division of units was found to be three batteries of two 250 horsepower water-tube boilers each, and two units of 300 horsepower each.

FAN ROOM, SHOWING 200-IN. FIRST FLOOR AND BASEMENT BLOWERS, NEW ALTMAN BUILDING

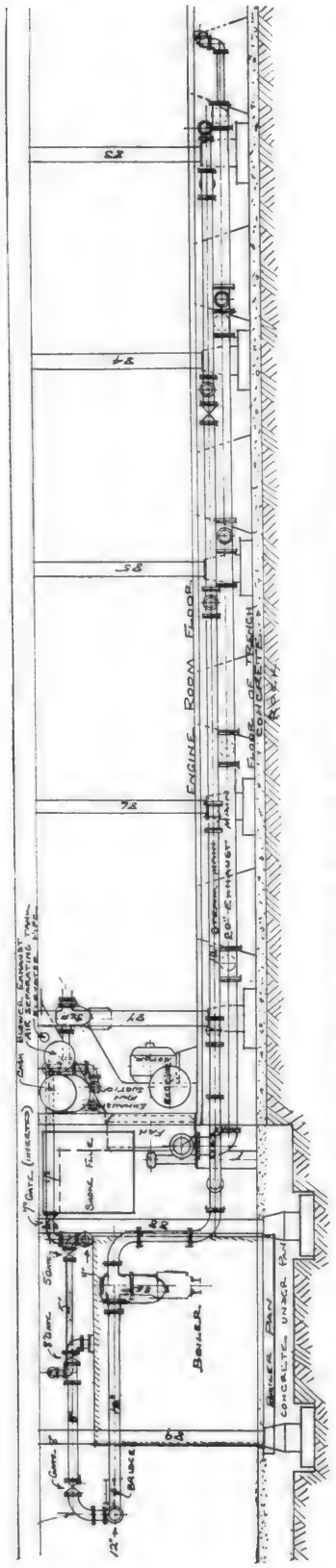
VIEW IN ENGINE ROOM, SHOWING ELEVATOR PUMPS



SUPPLY AND EXHAUST AIR DUCTS IN BASEMENT



T BASEMENT OF NEW ALTMAN BUILDING, NEW YORK



CROSS SECTION THROUGH ENGINE ROOM, NEW ALTMAN BUILDING

This allowed one battery, or one unit, to be kept in reserve at all times for emergencies and cleaning.

The other apparatus, vacuum sweeper, pneumatic tube blower, fans, etc., are electric driven, as power obtained electrically from the large economical engines is cheaper than power from separate small wasteful steam units.

Steam was preferred to electric drive for the boiler feed and house service pumps, because of ease of speed control and simplicity.

EQUIPMENT OF PLANT

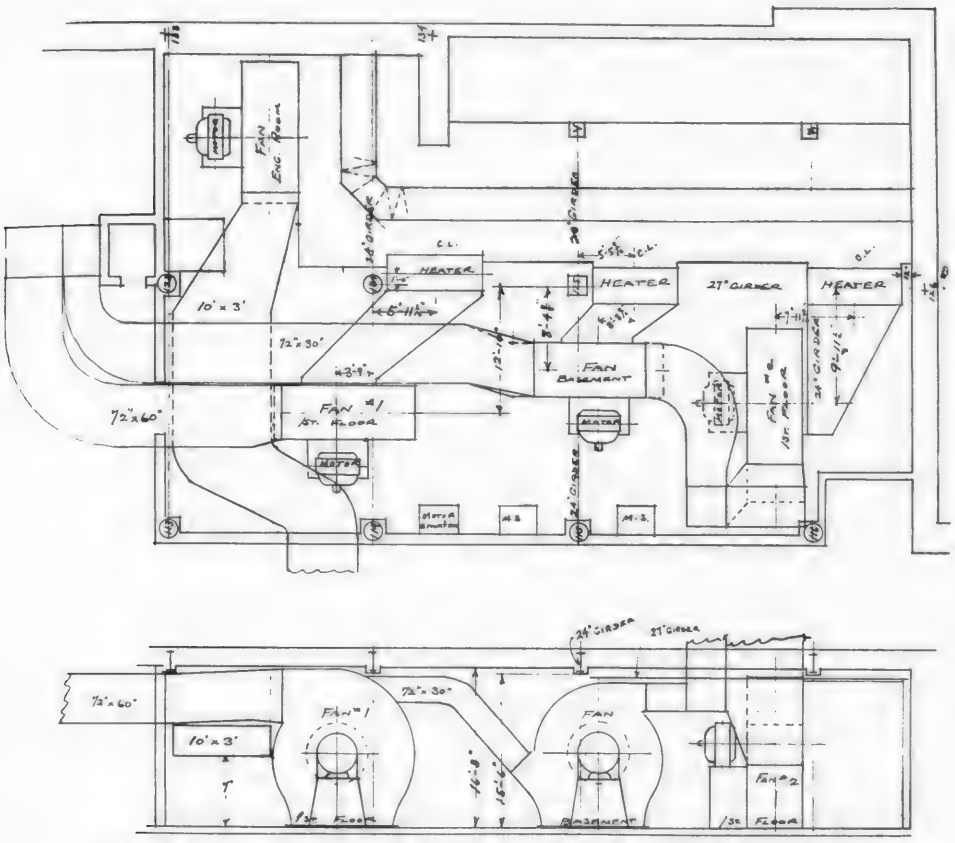
To summarize, the plant consists of six 250 horsepower boilers (Aultman-Taylor) Babcock & Wilcox type, two 300 horsepower boilers (Aultman-Taylor) Babcock & Wilcox type, three 600 horsepower engines (Ball & Wood), two 300 horsepower engines (Ball & Wood), three 400 KW. General Electric dynamos, two 200 KW. General Electric dynamos, four 200-in. blowers, two 200-in. exhausters, one 9 ft. diam. cone fan, one 50-in. blower, one 90-in. blower, and one 90-in. exhauster. All of the blowers, cone fan and exhausters are those of the American Blower Company. The electric switchboard was furnished by the Metropolitan Switch Board Co., New York.

Two 100 horsepower pneumatic tube blowers (Roots Co.), one elevator pump (2,800 gal. per min. capacity) Laidlaw-Dunn-Gordon make, two elevator pumps, 18 and 29x16x18 (Worthington duplex), one 20 horsepower vacuum sweeper, two Frick refrigerating machines (for ice water), one fire pump, 500 gal. per min. Worthington duplex, two Worthington duplex, 8 and 12x7½x10 house pumps, two boiler feed pumps, 8 and 12x7x10 Worthington duplex, outside packed plungers, one smaller feed pump for nights and Sundays, besides steam and electric sump pumps, vacuum pumps for returns, air compressor, and all auxiliary apparatus, including feed water heater, filter, etc.

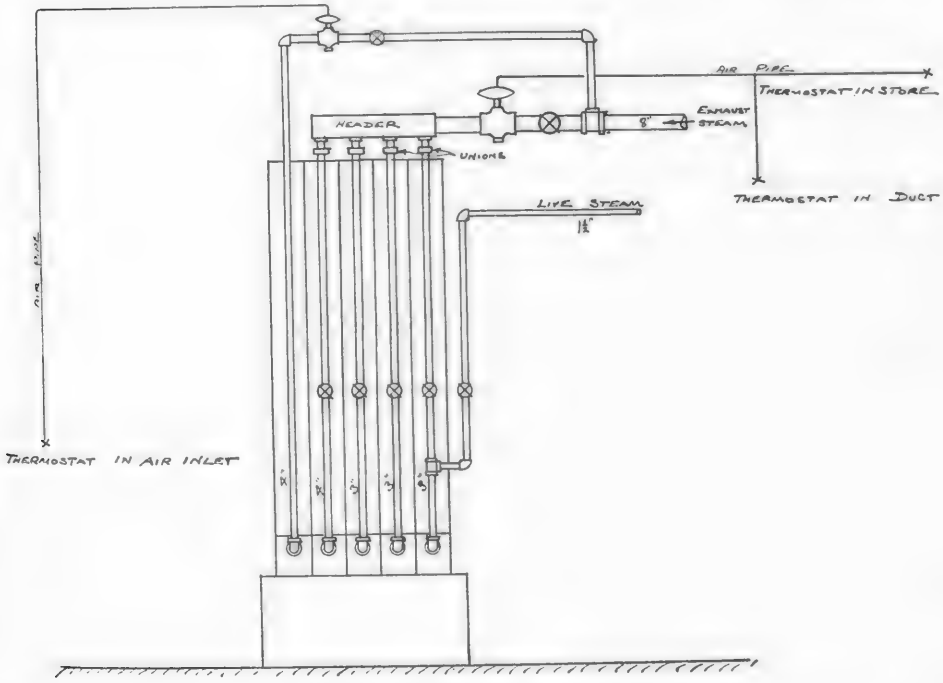
The four centrifugal steel plate blowers required for ventilation are all placed together in a room provided for that purpose at the foot of fresh air intake in the rear of sub-basement. This was the only place available for an air intake where reasonably clean, cool air could be expected. The air comes down from the court on the easterly end.

Screens were provided for catching the dust. They were made up in the usual way of wooden frames, covered with wire netting and cheese cloth, and set zig-zag in metal frames, a nozzle from vacuum sweeper was provided for cleaning them.

Heaters are in the usual form of coils of 1-in. pipe, set staggered in cast iron bases. All four fans have 10-foot wheels, and each is direct connected to a 30 horsepower motor. They draw



PLAN AND ELEVATION OF FAN ROOM IN NEW ALTMAN BUILDING



STEAM CONNECTIONS TO INDIRECT HEATER, NEW ALTMAN BUILDING

through heaters and discharge directly to the ducts.

It may be worth noting that the plans were worked out in conjunction with the architect's plans, and the results obtained proved very satisfactory. Instead of altering plans well advanced, the concessions which both engineer and architect were obliged to make were worked into the preliminary plans. These points included, besides space for plant, proper positions and space for stack, pipes and ducts, fresh air intake for ventilation, and framing for holes through floors and other parts of steel work, etc. Also, the relation of all parts of the mechanical equipment to each other and to the building, always letting the lesser give way to what would prove to be the greater ultimate advantage to the owner.

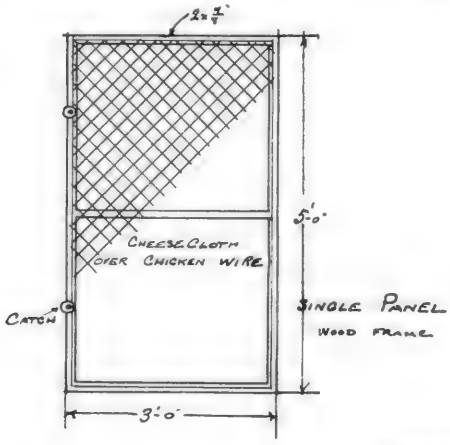
THE HEATING REQUIREMENTS

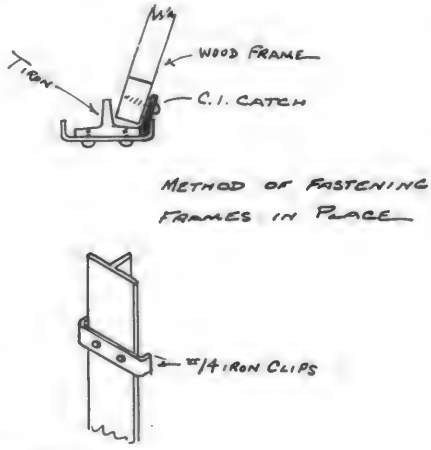
As before stated, the building is rectangular in shape and exposed on all four sides, except a part of the easterly side; it has a great deal of glass surface, low sills, a central court above, and a rotunda through lower floors. Further, each story is one large room, except for such low partitions as are required for fitting rooms, etc. Each story was treated by itself in estimating the amount of heating surface required, but, in every case, the heating surface was distributed around the room against the outside walls in the form of coils under windows.

In estimating the amount of surface required it was figured that on cold, blustery days, when the most heat is needed, there would be, due to imperfect joints around window casings, a continual motion of the air across the rooms from the exposed toward the leeward side. This would make the surface on the leeward side of little value in heating the air in the room. On such days as this the wind is invariably from some quarter between west and northeast, consequently the heating surface on the south and east sides was figured to take care of little more than the radiation losses from walls and glass on these sides of the building in zero weather. (These figures being based on the formulæ for this purpose in general use.)

The heating surface on the north and west sides, in addition to providing for radiation losses, was figured to heat a complete change of air in the room every two hours. Last winter's experience in heating showed this arrangement to be satisfactory.

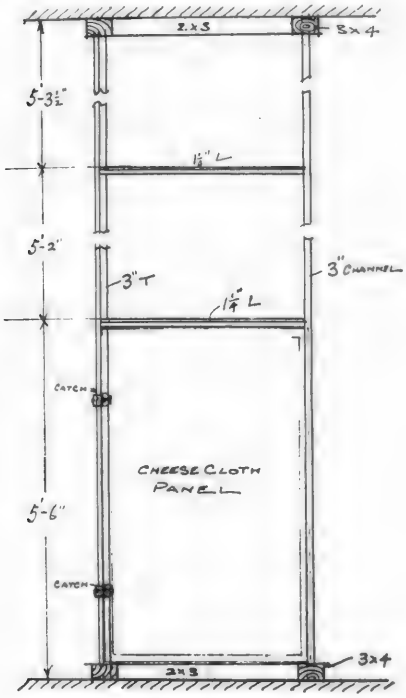
To get the required coil surface below the sills necessitated doubling them, and as the wall was divided by pilasters every 20 ft., except on the two top floors, the coils were divided into pairs of return bend coils placed side by side in floor stands. These coils were separately valved, giving a very flexible system for local control, and yet making it possible to keep one-half the entire surface heated and distributed all around the exposed walls. On the top floors longer header coils were used. On the return end of every coil is an automatic thermostatic valve permitting the condensation to drain away, but preventing steam escaping into the returns. This enables a pump to maintain a vacuum in the return lines, and insures a perfect circulation without back pressure on the engines. It also admits of graduating the heat in individual coils by choking down the supply of steam. This arrangement, the Webster system of heating, was adopted for the reasons above mentioned. The steam is supplied to the coils on the down feed system; i. e., the mains supplying steam to the vertical rising lines are run around under the roof, instead of in the basement. There is a space between the top story ceiling and roof in which water pipes are run, and where the heat radiated from covered steam mains is an advantage, while it would not be in the basement.





SCREEN DETAILS

An additional reason for placing the heating mains in the roof space is found in the fact that the basement ceiling is covered several layers deep with a network of pneumatic tubes, sprinkler pipes, conveyor belts, etc. Finally, the down-feed system is slightly cheaper to install.



SCREEN DETAIL

Especial care was taken to remove the oil from exhaust steam, so that the condensation returned to boilers would not carry any grease with it. Steam after leaving the engines is first led through a grease extractor in the basement, thence up to roof and into a tank with baffle plates before entering the heating system. Returns are discharged from a vacuum pump into a receiving tank, which also receives other clean drips. This tank is placed high enough above the boiler feed pumps for the hot water to flow to them with some pressure. This prevents racing from loss of suction.

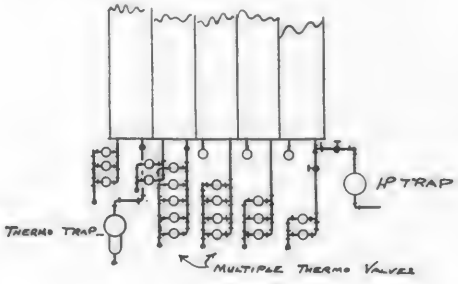
Between the pumps and feed heater and boilers is a charcoal filter which removes any traces of oil that may have escaped two traps set for it in the steam.

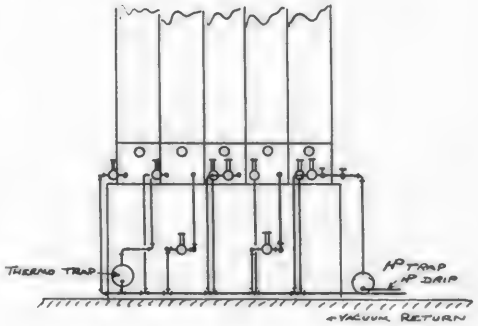
THE VENTILATING REQUIREMENTS

As before stated, a blower system was adopted for the heating and ventilation of the first floor, basement and sub-basement, and as the requirements of each of these floors differed radically from the other two, each was treated separately and provided with a separate system of ducts and fans; the fans all being together in fan room in sub-basement, as described before. From this fan room a main duct was run up and around on the basement ceiling along the north side with branches up into the first floor.

A similar duct was run around the south side, with provision for extending into that part of the store which will be built at some future time on the Thirty-fourth street corner plot, now cut out. These two ducts were from separate fans and heaters.

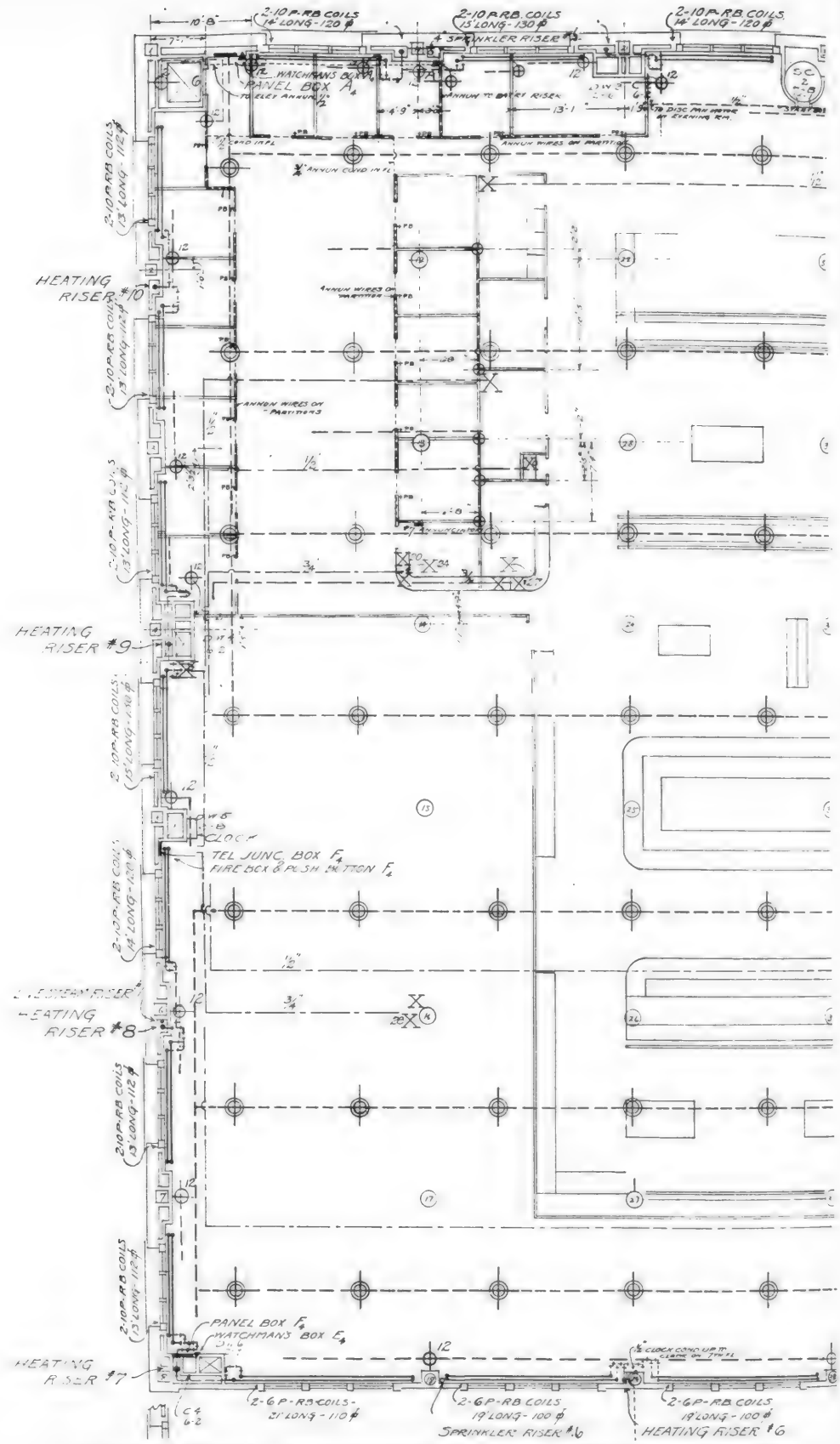
In determining the sizes of these ducts and fans, etc., 2,000 cu. ft. of air per hour for each person was allowed, and it was estimated that 2,500 people would have to be supplied at times. This amounts to 83,000 cu. ft. per min., and two steel plate fans with 10 ft. wheels are required to supply this air at ½-oz. pressure. This changes the air five times an hour in the first story. It escapes up the rotunda, and much of it is diffused through floors directly above. Account was taken of this in figuring coil surface.



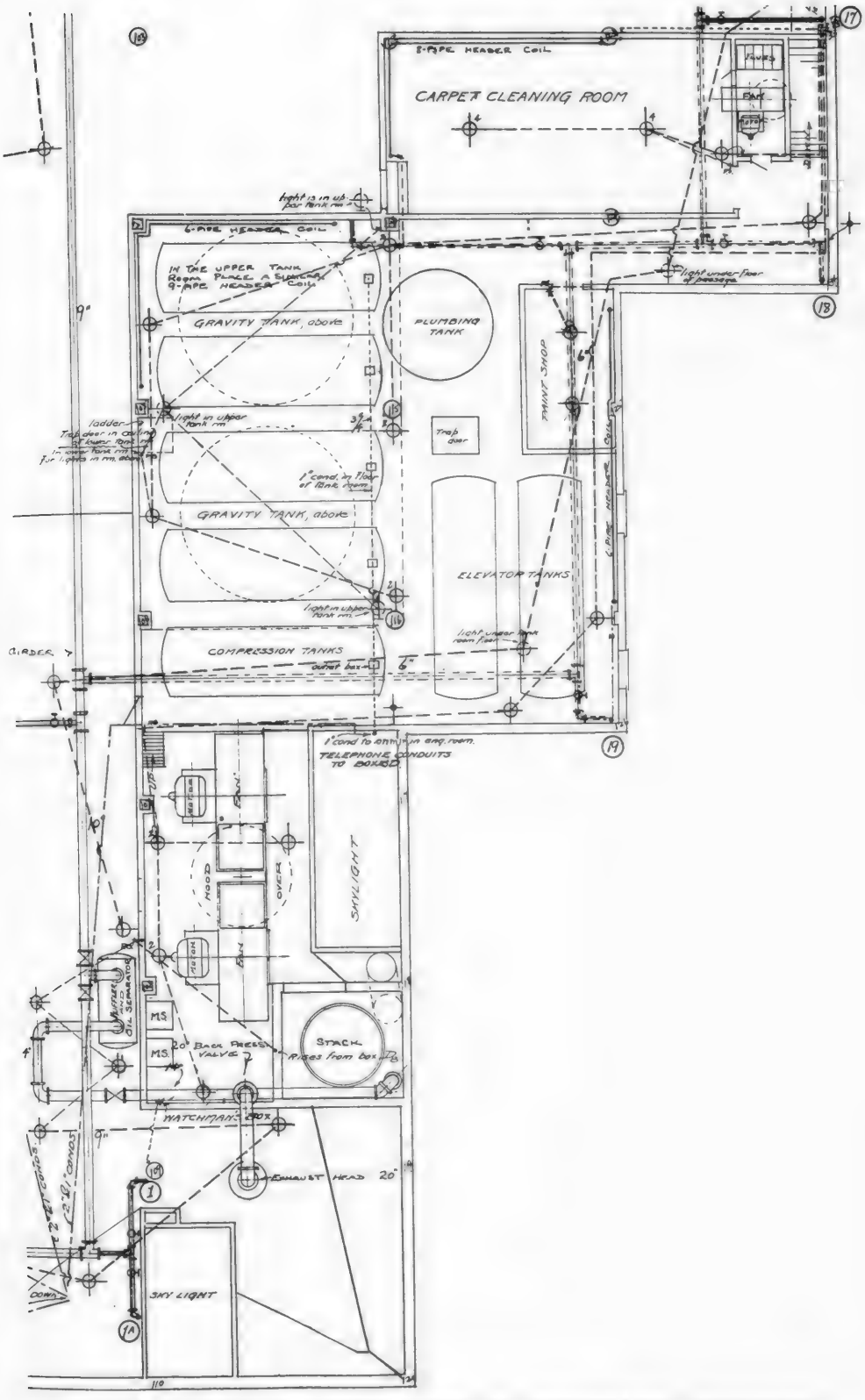


INDIRECT HEATER DRIP CONNECTIONS

As is always the case, some difficulty was encountered in finding space for ducts and registers. The arrangement adopted was to blow as much air as possible in over the cases and shelves around the side walls, just under the window sills, which are 8 ft. above the floor. This air was allowed to escape


2-10 P-RB COILS 14' LONG-120 ϕ
2-10 P-RB COILS 15' LONG-130 ϕ
2-10 P-RB COILS 14' LONG-120 ϕ
4" SPRINKLER RISER
WATCHMANS CLOCK
PANEL BOX A4
TO ELEC ANNUN
ANNUN TO BELL RISER
ANNUN WIRES ON PARTITION
4" ANNUN COND IN FL
2-10 P-RB COILS 13' LONG-112 ϕ
HEATING RISER #10
HEATING RISER #9
HEATING RISER #8
HEATING RISER #7
2-10 P-RB COILS 15' LONG-130 ϕ
2-10 P-RB COILS 14' LONG-120 ϕ
2-10 P-RB COILS 13' LONG-112 ϕ
W & B CLOCK
TEL JUNC BOX F4
FIRE BOX & PUSH BUTTON F4
4" STEAM RISER
PANEL BOX F4
WATCHMANS BOX E4
2-6 P-RB COILS 21' LONG-110 ϕ
2-6 P-RB COILS 19' LONG-100 ϕ
SPRINKLER RISER #6
2-6 P-RB COILS 19' LONG-100 ϕ
HEATING RISER #6

TYPICAL FLOOR PLAN, PORTION OF FOURTH FLOOR, NEW ALTMAN BUILDING



PORTION OF ROOF PLAN, SHOWING EXHAUST STEAM HEATING CONNECTIONS

at a velocity of 500 ft. to 600 ft. per minute from the registers. The balance of air required was distributed in registers placed under the counters; some of those were concentrated near the entrances. The velocity of air from these low registers was kept down to 300 ft. per min., and, wherever possible, they were placed in the ends of counters where few people would be apt to stand.

The temperature of the entering air is controlled by two thermostats, placed on columns on either side of the floor, which act on valves controlling steam to the heaters. The Johnson system was used for this.

The temperature of the air in ducts is further controlled by thermostats placed in the ducts so that it is never allowed to fall below 65°. There is also a thermostat in the fresh air intake controlling steam to one outside section of each of the heaters, set to turn steam on whenever the temperature of incoming air falls below the freezing point, to prevent bursting pipes over nights and Sundays.

In addition to proportioning ducts and branches for the velocities and volumes assigned to each, dampers and deflectors were provided, and, after putting the plant in operation, these were properly set with the aid of an anemometer.

A separate fan and heater drawing air from the basement was provided for each of the main vestibules on Fifth avenue and Thirty-fourth street. The air is blown in from both sides low down, and from the back toward the front out of high narrow registers placed between the doors. With large crowds entering, and a cold wind, either from south or west, the air would blow through the vestibules far into the store, making it almost impossible for salespeople or customers to stay anywhere in the neighborhood. By means of these separate fans and heaters, air at high temperature, under pressure, and in great volume, as compared with the size of the vestibule, is forced against and across the incoming blast, offering a warm air blanket as a shield against the draft, and almost entirely overcoming its objectionable features by heating it before it enters the store. As soon as the doors close the whole space is filled with warm air, the fan being able to fill the space in three-fourths of a minute, and this offers an added protection.

This system is the only system we have found that will accomplish the result desired, and it does it very well. The air pressure maintained in the vestibules also aids in preventing the doors from being blown in and open by the outside pressure, and makes the doors less hard to open, as lighter door checks may be used.

A separate fan and heater was provided for the basement, which is used for the receiving and shipping departments, pneumatic tube rooms, etc. This proved to require one-half the amount of air delivered to the first floor and a fan of the same size as the others. The duct from this fan was split and carried around both sides on the ceiling of the basement alongside the ducts for the first floor. Where these ducts come together near the fans, openings were cut and deflectors so placed that the first floor fans could discharge air into the basement or the basement fan into the first floor, if one fan should be shut down.

The arrangement of ducts in the basement introduces fresh air around the outside walls, and it is exhausted from the center by a duct with branches running down the middle of the room. This duct is connected into the space around the smoke stack, and air is exhausted by two fans placed on the roof. These are steel plate exhausters with 10 ft. wheels. The temperature of air entering basement is also controlled by a thermostat.

VENTILATION OF ENGINE AND BOILER ROOMS

The engine and boiler rooms too often receive scant attention in the ventilating line, but in this case especial steps were taken to make them comfortable on the principle that the efficiency of the force of engineers and mechanics is undoubtedly impaired by physical discomfort. No provision was made for heating the air for obvious reasons, and it was blown in all around the outside walls of the engine room in quantities sufficient to change the air completely every six minutes. The fan has a capacity of 50,000 cu. ft. per minute. The air is discharged downward, and, with the fan speeded up to its full capacity, there is a perceptible draft from each register which is, however, not at all objectionable.

Down the center of the room is an exhaust duct with openings over the hot cylinders of engines and pumps. This duct is carried to the suction of a 9 ft. cone fan, set in the wall of the boiler room back of the boilers. The effect of this system was to keep the temperature of the engine room below 95° at all times and usually below 85°, during the summer, when it is not uncommon to find the temperature in many such places ranging from 105° to 130°.

As just stated, air is blown into the boiler room behind the boilers, and while some of it rises over the boilers, part finds its way to the front between them. Above the boilers and running the length of the room is an exhaust duct connected into the space around stack. The air above the boilers is generally very hot, and in addition to the exhaust duct placed there, a separate vertical duct open at the top was run down the side

of each boiler and conected into the ash pits. Dampers in these ducts enable the firemen to control the air to fires, drawn down from above where it is hottest instead of taking in the cool air below through ash pit doors. When running full load, the air required for combustion is one-third of all that is blown in from the engine room, and there is enough more exhausted over the boilers to induce a free delivery of air down from openings in the sidewalk. This keeps the space in front of boilers comfortable for firing without any direct blasts of cold air on the men or piping.

The high pressure piping system, while not directly a part of the heating system, is closely enough related to it to allow a note as to the methods employed in its design and construction. Briefly, the system consists of a 12-in. and a 7-in. header across the boilers, each connected separately to each boiler. From the middle points of these headers separate 12-in. and 7-in. mains were carried into the engine room. The 7-in. main was run overhead and connected to pumps, while the 12-in. main drops just back of the boilers and runs under the engine room floor in a space 6 ft. high between the building piers; connections to electric engines are all taken from this main.

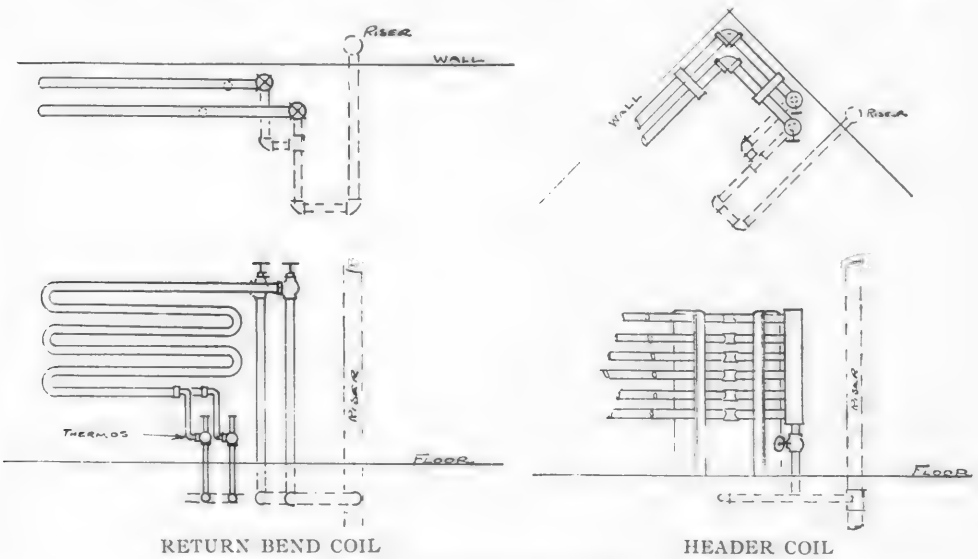
The two mains are cross-connected at their extreme ends. They are further cross-connected at each end of headers over boilers, and are so valved that in the event of trouble anywhere along either line, at least one-half and, in most cases, the entire plant might be kept in operation. Pipe and fittings are extra heavy. Long radius cast iron fittings, long sweep pipe bends, and Walmance flanged joints with Merwerth lead gaskets are used throughout.

Expansion is taken up in drop from boiler to engine room, and in long bends on engine connection. The exhaust main is run under floor alongside steam main. A somewhat unusual precaution, but one quite necessary in case of repairs on exhaust line, is a separate emergency exhaust from one engine carried into smoke breeching. The occasion for using this connection would be at night when little power is needed.

In general, the system has operated about as expected, and the results have been satisfactory. Some difficulty was experienced in obtaining proper ventilation of the toilet rooms under the sidewalk in the basement because of low headroom and distance from exhaust flue. This was overcome by changes in ducts at this point.

The exhausting of air from the space around the stack was also not quite up to expectations, due largely to the necessary encroachments of iron beams, pipes and other incidentals to building construction. To overcome this, the exhaust fans on roof had to be speeded up above their calculated speed. Other than this, no material changes from the system as designed were found necessary.

The architects of the building are Trowbridge & Livingston, New York. Percival Robert Moses, New York, was the consulting engineer for the steam and electrical equipment and power plant. The author had direct charge of the design of the steam equipment and of the installation as Mr. Moses' assistant and representative on the job. The contractors for the steam heating are Gillis & Geoghegan, New York.



RETURN BEND COIL HEADER COIL

DOUBLE COIL CONNECTIONS, NEW ALTMAN BUILDING

THE HEATING AND VENTILATING MAGAZINE

Vol. 5 February, 1908 No. 2

PUBLISHED MONTHLY AT
1123 BROADWAY, NEW YORK
BY THE
HEATING AND VENTILATING MAGAZINE CO.
President, R. C. CARPENTER
Secretary and Treasurer, A. S. ARMAGNAC
The address of the officers is the address of this magazine.

A. S. ARMAGNAC, EDITOR

European Representative:
AMERICAN PUBLICATION BUREAU, 31, Overton Road, Leicester, England

Subscription,	$1.00 per year
Foreign countries,	1.50 " "
Back numbers,	15 cents a copy

Manuscripts submitted for publication must in every case be accompanied by postage; otherwise they will not be returned.

A REMARK made at the annual dinner of the heating engineers' society that one of the questions to be decided in the future is whether the society will affiliate with one of the larger engineering bodies was more than a passing remark in the light of a recent action taken by The American Society of Mechanical Engineers. It seems that when the mechanical engineers met in December the sessions on the discussion of gas power proved so interesting that a separate section was carried on simultaneously with a symposium on foundry practice. The splendidly equipped new Engineering Societies Building in New York, with its eight auditoriums, proved most conveniently arranged for this purpose. The idea of separate sections proved so satisfactory that, at the conclusion of the meeting, formal application was made by some twenty members to form a permanent section on gas power engineering. The matter was presented to the council of the society, which acted by appointing a committee on affiliated societies to arrange the details in conformity with the rules of the constitution for the formation of sections. The president's address, dealing with this phase of the society's broader usefulness, was also referred to this committee.

THIS committee on affiliated societies has now prepared a report, approving and broadening the section idea and embodying rules for the organization of sections, which will prove "mighty interesting reading" for members of such societies as that of the heating engineers. In the first place, members of a professional section are to be known as affiliates of the mechanical engineers' society. Such sections shall be designated as ——— Section of The American Society of Mechanical Engineers, the blank being filled by the topic specialized. Each section is to have an executive committee for the conduct of its professional affairs, acting under the general direction of the council. This executive committee is to appoint its own secretary. Expenditures of the section chargeable to the society are to be provided for in the estimate and budget of the society's committee on meetings. Engineers and others not members of the mechanical engineers' society, but desiring to participate in the meetings of the section, may enroll themselves as affiliates, with the privilege of presenting papers and discussions. Their dues are to be nominal—$5.00 a year.

In commenting on the adoption of the resolutions for the organization of sections on the basis outlined

above, the significant statement is made in the Proceedings of the mechanical engineers that "it is felt that if at a previous time this same opportunity had been possible, * * * The Heating and Ventilating Engineers would not only not have been obliged to form separate societies, but as sections of this society, they would to-day be able to conduct their activities with at least equal satisfaction to themselves and presumably more, for the reason that they would be carried on at less expense."

THE HEATING AND VENTILATING MAGAZINE invites a discussion in its columns of the plan adopted by The American Society of Mechanical Engineers. While not prepared to indorse or reject the proposition as applied to the heating engineers' society, it is apparent that there are many distinct advantages in such a union.

In an age of consolidation the equipment and the machinery of a building like the Engineering Societies Building and of an organization like the mechanical engineers' society would undoubtedly offer more opportunities for the advancement of the art of heating and ventilation than could possibly be achieved upon the present basis. On the other hand, there is the natural and proper pride in the development of an independent organization and the reluctance to see its individuality absorbed in the larger body. Briefly stated, these, we think, are the two sides of a question which may come up for decision much sooner than might be supposed.

A PROPOSAL that the central station heating companies in New York State be placed under the direction of the Public Service Commission, coupled with the reports of complaints made against such companies where they have recently begun operating in the middle west, calls attention to an objectionable feature of such plants which outweighs many of their advantages. In both cases cited, the trouble complained of is that the heating companies, in accordance with the terms of their franchises, are continually tearing up the streets at all times of the day and night for the purpose of making repairs. The result has been that the streets in some cities are in a constant state of repair due to excavations made by the heating companies, while, in others, the failure of the companies to repair the streets properly has led to an even worse condition.

As a result of the situation, some of the eastern cities are having a quiet laugh at their western friends who have prided themselves upon their improved facilities for heating. One writer in the Springfield (Mass.) Republican says: "It will serve to remind Springfield people of the fact that this thing (central station heating) was tried out in this city and finally abandoned. It will be remembered that the local gaslight company for years maintained a large heating plant, and the result was not desirable, so far as the streets were concerned. Not only was the snow quickly melted off in winter, but there was involved a constant and most annoying digging up of the surface of the streets. The nuisance of it finally became so great that the gaslight company abandoned the field of its operations, much to the general satisfaction."

Heating Engineers' Society Annual Meeting

(Continued from Page 17.)

The next paper on the programme was entitled, "The Transmission of Heat Through Radiator Surfaces at Various Temperatures,' by Prof. John R. Allen.

This paper was received too late for publication among the advance copies of papers, and, in the absence of Prof. Allen, was read by Prof. Kent from manuscript.

It was voted to withhold the publication of the paper until the summer meeting so as to give the members an opportunity of reading it and preparing further discussions of it.

DISCUSSION

MR. CARY: I have noticed in some of the experiments there are two factors affecting the transmission of heat through radiator surfaces. It has become apparent to me that when a considerable amount of air collects inside the radiator and clings to the inner surface of the radiator, the transmission is less. In other words, the air will distribute itself as a film over the inner surface of the radiator and act as an insulator.

The other matter is the action of the air against the outer surface of the radiator. We all know very well that a radiator placed in a still room will not transmit as much heat as when that radiator, or pipe coil, is placed in the path of a blast. Taking the fan blast apparatus, we have a greater amount of heat delivered per square foot of radiating surface than we do when the radiator is placed in a still atmosphere.

PROF. KENT: The important fact is that it confirms what has been written by others upon the subject, that the coefficient of radiation per square foot is not a constant quantity, the greater the difference of temperature. The greater the difference of the coefficient. From 1.7 to 1.3 is practically the same, but the coefficient increases as you increase the temperature.

The rate of transmission of heat does not vary directly as the difference in temperature between two surfaces but probably as the square of that difference.

TOPIC NO. 3

Austrian Coefficients for the Transmission of Heat Through Building Materials

W. W. MACON.—Feeling that the figures for the transmission of heat through building materials, as adopted by the Society of Austrian Engineers and Architects, might well be placed in the records of this society, especially as these figures allow for some interesting observations to be made in comparison with the present practice in this country, a translation was made of the published figures of that society, reducing the figures as given in the metric system to those of the English system here in use.

Generally speaking the coefficients are much higher than those regarded as high enough in this country, although it is understood that they are based on tests made in connection with the heating and ventilation of the new stock exchange at Budapest. The percentage increase or correction to be made for exposure or for the location of the rooms in a building is not so great as commonly employed in this country, but the difference is not enough to bring any equality in the total heat calculations.

For example, after the amount of transmitted heat is calculated for a given room an increase of 20% for a northern exposure is provided for, where it has been common to use as much as 35% in this country, and for east and west exposures the figures are increased by 15%, whereas, a room with a western exposure is here subject to a factor increase of 35% and when on the east side of the building to one of 25%, while a south room would have the calculation increased by say 15%, where the Austrian figures do not allow for any increase for the southern exposure at all.

The higher figures are all the more surprising when it is recalled that structures in this country are generally assumed to be built not so carefully or substantially as the average building abroad, so that there is greater inleakage of winds and more difficulty in maintaining interior temperatures in America than in Austria or Germany. The figures are also interesting in that they serve as an example of the great refinement to which the foreign engineer is wont to go. It may be added that the transmission of heat through different types of floors and roofing is given, with a detail illustration of the type of floor and roof, and that the coefficients for transmission through concrete are included.

An accompanying table (Table I) gives the value of transmission of heat through various kinds of brick, stone and concrete. It will be noted that the sandstone and limestone are subject to the greatest loss of heat, the limestone averaging about 10% more than the sandstone; that ordinary concrete is the next greatest loser of heat; but that concrete with an air space is, for the ordinary thicknesses obtaining in building construction, a smaller loser of heat than ordinary brick walls. The singular thing in connection with a concrete wall with an air space is that while it loses less heat for the smaller thicknesses of wall,

as compared with the same thicknesses of brick wall, it loses more heat in proportion than does the brick wall, as the thickness of wall is increased.

The original figures include those for partition walls of brick, plastered, but these are not given in the table, as they are about 10% less than outside plastered brick walls, this being an indication of the fact that inside and outside brick walls are differentiated.

TABLE I.—HEAT TRANSMISSION THROUGH BUILDING WALLS

Number of British thermal units per square foot of surface per hour for 100° F. difference in temperature on opposite sides, other temperature differences being proportional, so that for 70° difference the coefficients are 70% of those in table.

	Brick.				Concrete.			
Thickness. Inches.	Plastered in and out.	Plastered. inside.	With 2-in. air space.	With 1-in. air space.	Sandstone.	Limestone.	Ordinary.	With air space.
8	72	78	..	41	..	..	89	54.5
12	56	61	48.5	35	104	115.5	77	50
16	46	50	39.5	31	91.5	101.5	67	46
20	40	43	34	..	81.5	90	59.5	42.5
24	34.5	37	30	..	73	80.5	54	39.5
28	30	32.5	27	..	66	73	49	36.5
32	27	29	24	..	60	67	45.5	34.5
36	24.5	26	22	..	56	61.5	42	32.5
40	22.5	23.5	20	..	52	57	39	30.5

The figures published by the Austrian Society cover also brick walls with stone facing. It gives the coefficients for brickwork, 4, 10 and 20 in. thick with stone facing 5 to 40 in. thick, and the refinement is carried to such a degree that the coefficients for heat transmission are given for brick walls with a limestone facing and also with a sandstone facing. The figures for the 4-in. brick wall with both limestone and sandstone are practically the same as the figures for a brick wall plastered inside and out. The values for a 10-in. brick wall with stone are a little greater than the brick walls.

A second table gives the heat transmission through partitions and inner walls.

TABLE II

HEAT TRANSMISSION THROUGH PARTITIONS AND INNER WALLS

Number of British thermal units per square foot of surface per hour for 100° F. difference in temperature on opposite sides, other temperature differences being proportional, so that for 70° difference the coefficients are 70% of those in table.

Thickness. Inches.	Wood.	Wood plastered both sides.	Ordinary.*	Plaster construction.
⅜	100	..	..	..
½	94	..	..	..
¾	79	48	..	..
1	74	44	..	..
1½	..	38	115	112
2	..	..	110	106
2½	..	..	101	100
3	..	..	94	94
3½	..	..	89	90
4	..	..	84	85

* Brick partition walls plastered about 10% less than outside plastered brick walls.

VALUES FOR FLOORS AND ROOFS

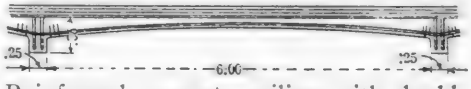
The values for various types of floors and roofing are as follows:

Plaster ceiling, planks, filling, double wood floor, 10 B.T.U. per 100° difference.

Single Wood floor, 59 B.T.U. per 100° difference.

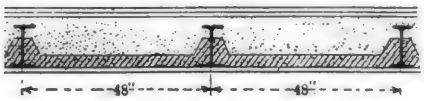
Plaster ceiling, air space, filling and soft wood floor, with cold air above, 18 B.T.U. per 100° difference; with cold air under, 8.8 B.T.U. per 100° difference.

Plaster ceiling, air space, filling and double floor, with cold air above, 15.8 B.T.U. per 100° difference; with cold air under, 8.1 B.T.U. per 100° difference.



Reinforced concrete ceiling with double flooring, 43 B.T.U. per 100° difference.

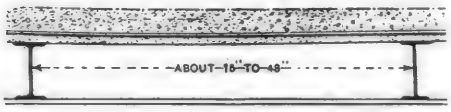
Reinforced concrete ceiling, with double flooring and plaster ceiling inclosing an air space, 33.6 B.T.U. per 100° difference.



Reinforced concrete ceiling, with plaster expanded metal construction, concrete with expanded metal, filling and double flooring:

Beams.

6 in.....28 B.T.U. per 100° diff.
7 in.....25 B.T.U. per 100° diff.
8 in.....22 B.T.U. per 100° diff.
9 in.....21 B.T.U. per 100° diff.
10 in.....19 B.T.U. per 100° diff.
12 in.....17 B.T.U. per 100° diff.
15 in.....14 B.T.U. per 100° diff.
20 in.....13 B.T.U. per 100° diff.



Reinforced concrete roof, with plaster, inclosing an air space, cement with expanded metal reinforcing, asphalt and gravel covering, 36 B.T.U. per 100° difference.

(To indicate the refinement in practice, it may be stated in this connection that figures are given for beams 6.3 in. high to beams 21.7 in., and for each of these different heights a value depending on the spans between the beams. The figures vary from 35.9 heat units for the case where the girder is 6.3 in. high and the span 48 in. to 36.3 for the case where the beam is 21.7 in. high and the span 32 in.)

Reinforced concrete roof without air space, 103 B.T.U. per 100° difference.

Tar paper roof over 1-in. boards, 78.5 B.T.U. per 100° difference.

Zinc and copper roofing on 1-in. boards, 80 B.T.U. per 100° difference.

Slate roofing on 1-in. boards, 77 B.T.U. per 100° difference.

Tiling without boards, 178 B.T.U. per 100° difference.

Corrugated iron without boards, 383 B.T.U. per 100° difference.

WINDOWS AND SKYLIGHTS

Single windows about ⅛ in. thick, 195 B.T.U. per 100° difference.

Single windows, about ¼ in. thick, 192 B.T.U. per 100° difference.

Double windows, 84½ B.T.U. per 100° difference.

Wired glass, 188 B.T.U. per 100° difference.

Single skylight, 206 B.T.U. per 100° difference.

Double skylight, 86.5 B.T.U. per 100° difference.

DOORS

For doors, values are given for outside and inside doors, and for doors of soft and of hard wood. The coefficients are given in an accompanying table:

TABLE III

HEAT TRANSMISSION THROUGH DOORS

British thermal units per square foot of door per hour for 100° difference in temperature on opposite sides of door, other temperature differences being proportional.

Thickness. Inches.	Soft wood. Inner.	Outer.	Hard wood. Inner.	Outer.
¾	82	89	108	125
1	70	76	98	113
1½	56	60	85	95
2	47	50	75	83
2½	38	41	66	73

DISCUSSION

PROF. KENT: The figures are surprising. As I remember the figures for a 16-in. wall, I think we have about 23 B. T. U. for 100° difference in temperature and the figures here are 46. Former tables, based on Peclét's results, show 103 for single windows and I think most tables give 120. This table gives 195, a tremendous difference.

MR. MACON: I was surprised at the glass surface efficiency. I have talked with others and they cannot give any reason why these figures should be so large.

MR. CARY: I notice in this discussion, provision is made for concrete construction. The hot water heating committee did not touch on concrete construction and I think it would be well if data could be collected on this subject and the society furnished with the necessary coefficients.

TOPIC NO. 4

The Additional Amount of Radiation Seeming Advantageous for Warming Rooms Exposed to the Strongest Wind Effects.

VICE-PRESIDENT MACKAY: Is not that subject one largely with the engineer—what the fitting of the doors and windows may develop in the way of leakage? Is it not a matter that cannot be governed by factors and coefficients, etc.? I would like to hear from some one who has treated that subject.

H. W. WHITTEN: I have had occasion during the last year to make investigations

as to window leakage. Many of them were crude, but, taken as a whole, there were some satisfactory results. In order, however, to carry the thing further, we erected an apparatus consisting of a fan attached to a sheet iron cone which was flanged to a window frame so there was no leakage. This window frame contained an ordinary window, 2 ft. x 4 ft. This window was then subjected to pressures from the fan, varying from nothing up to about 2.3 in. Various sashes were tested, one with 1/32 in. clearance all round; the next one with 1/16 in. clearance, such as an ordinary window, 2 ft. x 4 ft. This one was protected with a good type of metal weather strip, the object being to find out how much leakage we got with the varying conditions. A cone was attached to the frame on the opposite side from the fan and the leakage was measured by an anemometer.

The results were rather astonishing to myself and to the others who participated in the experiments. To boil the thing down, it was shown that about 30 B. T. U. for every square foot of glass surface was the leakage in the ordinary window of that type with 1/32 in. clearance; and that was increased to about double for the 1/16 in. clearance. As the higher pressures were reached, the leakage did not increase in proportion to the pressure, the assumption being that the pressure of the wind on the sash set it closer against the stops and prevented proportionate increase.

The figures at the 1/10 in. pressure give, per lineal foot, either on the side or across the window, with the 1/32 in. clearance, 105.6 cu. ft. per foot of joint per hour. For 1/16 in. clearance, 184.9 cu. ft. one foot of sash in one hour. With the metal weather strip, 12 cu. ft. We all agreed that 1/10 in. pressure equalled a wind velocity of about 15 miles per hour; 5/10 in. equalled about 34 miles per hour, and gave 279 cu. ft. per foot of lineal joint in the 1/32 in. of opening; 1/16 in., 402 cu. ft. per foot of lineal joint; with the metal stop, 45.6 cu. ft. Going on up to 1 in., which is practically 48 miles per hour, 434 cu ft. with the 1/32 in. clearance and 591.6 cu. ft. with the 1/16 in. clearance, and 69 cu. ft. in the metal stop window.

Very many tests were made at each one of these pressures and an average struck, but the variation was very little. The highest pressure, 2.3 in., of which I have no practical record here, was obtained by discharging the air into a cone, tightly enclosed, and there would be, of course, no lateral motion of air. The lower pressures were obtained by opening a slide in this cone, allowing a lateral motion of the air, which was quite large.

In consulting with a number of prominent engineers of your society, they all agree there is a lack of information along these lines and they all agree as to total heat losses, but just how much is due to radiation from glass, how much from filtration through apertures, etc., they are not agreed. That is, without question, affected by the construction of the building. A building well constructed, with well-fitted window frames and sash, will unquestionably have less leakage than when loose construction prevails.

The point I wish to make is that engineers should have some uniform method of treating the openings about windows, insisting that they be properly treated and not put themselves at the mercy, so to speak, of the contractor, who puts in a variable something which only partly excludes the air and does not give protection against unfavorable conditions.

MR. QUAY: Have we any arrangement for publishing the data the last speaker has given? If not, it seems to me the society can well afford to make some special effort in some way to publish this data. I think this is the most important information that we possibly can have, and it has cost this gentleman a good deal to get it.

MR. CARY: This information is very valuable. I know it from personal experience. I did some work in a large building in the upper part of the city where the radiation was very carefully distributed. It was carefully gone over and found to be in accordance with good practice. I discovered, however, after the building had been up for a number of years that there was great leakage around the windows, and there were complaints of insufficient radiation. I went through the building and had all the windows carefully weather-stripped and there was no more difficulty in keeping the building as warm as desired.

I move that this material which has been offered be presented to the society. It is a subject upon which we have no information and I believe Mr. Whitten is the first one to give it to us

(Mr. Cary's motion was passed.)

MR. WHITTEN: In several cases, since I took this matter up, heating plants have been designed on the basis of the large elimination of radiation on account of reduced window leakage. In most cases, the reduction in the cost of the heating plant has been sufficient to pay for the application of the device to the windows.

The Report of the Proceedings will Be Concluded in THE HEATING AND VENTILATING MAGAZINE *for March.*

AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS

Heating Engineers' Annual Dinner

The annual dinner of the Heating Engineers' Society at the New Grand Hotel, New York, on the evening of January 22, at the close of the second day of the annual meeting, was again graced by the presence of the ladies, and the custom established a year ago at the instance of the Chicago members, when the society's summer meeting was held in that city, has now become an established order at the society's principal social event.

President C. B. J. Snyder was the toastmaster and seated with him at the guest table were present and past officers of the society, also President-elect James Mackay and Gilbert Evans, managing editor of the *Brooklyn Eagle*.

Prof. William Kent responded to the first toast, "The Training of an Engineer." Prof. Kent spoke in a humorous vein of the application shown by the young student in football, baseball and other athletic departments of the college, while in co-educational institutions, the girls proved a strong incentive in connection with his social attainments. "By the time he gets through college," said the speaker, "he does not know much engineering but he is a good fellow and don't be too hard on him."

Mr. Gilbert Evans responded to the toast, "Unsolved Problems." He said he envied the heating engineer in being out of the reach of the class of men who hunt the editor with a club. He said it was easy for the engineer to use those long technical terms, "but," he added, "he doesn't have to spell 'em, as we do." Mr. Evans proposed a list of topics that were capital take-offs of those on the society's programme and they brought forth roars of laughter.

William J. Baldwin, speaking for "The Old Guard," said in part: "In 1868, just forty years ago, I did one of my first heating jobs in this building. It was a crude affair as we would view it today. The water of condensation was carried to a tank and pumped back to the boiler. It was not considered practical to run the returns direct to the boiler. As for mechanical ventilation there was none. It was not considered important even in hospitals until 1880. Then came the gradual change from low pressure gravity systems to high pressure and this in turn was followed by the use of exhaust steam for heating purposes. The ventilation of the New York schools twenty-five years ago consisted of a fretwork in the various rooms which led to small flues."

Stewart A. Jellett spoke on "The Relation of the Society to the Business of Heating and Ventilation." "The relation," he said "of the engineer to the manufacturer and of the contractor to both has developed much in late years. It is now recognized that the successful contractor must be an engineer and that a manufacturer must be an engineer or have engineers on his staff. The tendency to keep information from others has practically disappeared. We want to see the feeling of friendship grow between the contractor, manufacturer and engineer."

C. V. Kellogg, speaking for the boiler manufacturers, expressed their willingness to coöperate with the heating engineers' society in devising a more satisfactory method for rating house heating boilers. He said it was important that the fire tube surfaces be rated alike and he suggested the appointment of a joint committee for that purpose. The specifications of the Hartford Boiler Insurance Co., for instance, vary in different cities and this would be something the committee would have to consider. "It took six months," he said, "to get the Hartford Co. to adopt a standard upon which the efficiency of goods can be rated. The manufacturers have started to adopt a standard and now it is up to the heating engineers' society to establish a rule or standard to measure, not the aggregate heating surface but the efficiency of the boiler. The manufacturers' and engineers' interests are a unit in this matter."

Andrew Harvey responded to the toast, "The Ladies." He said for the first time in his life he had that day not only been entertained and dined by the ladies (the entertainment committee) but they had insisted on footing the bill. "Not content with that," he said, "they took me to the Hippodrome. I shall certainly look forward with pleasure to my next visit here."

Prof. R. C. Carpenter spoke on "The Future of the Society." Prof. Carpenter said that one of the questions the society will be called upon to decide in the future is whether it will combine with one of the larger engineering societies and be a branch of same.

President-elect James Mackay spoke on "Summer Meetings." "It was at a summer meeting," he said, "that the ladies were asked to be with us at our dinners and they have been with us ever since. The summer meetings have grown much in importance during recent years and they have shown by their results the great opportunities that await the society in the west."

John F. Hale, the last speaker, spoke for the Illinois Chapter. "Before the Illinois Chapter was formed," he said, "the society was like a book without paragraphs. All books are divided into

chapters and so with the society. Then everybody will be given something to do."

Entertainment of the Visitors

Among the entertainment features tendered the visiting ladies was an inspection trip of the new Cunard turbine steamship "Mauretania." Special permission had been granted and the occasion proved a most enjoyable one. In addition a luncheon party was formed which afterward attended a matinee at the Hippodrome. Those who served on the local reception committee were J. A. Donnelly, chairman; Thomas Barwick, John A. Connolly, H. C. Mallory, together with an auxiliary committee of ladies composed of Mrs. C. B. J. Snyder, Mrs. W. M. Mackay, Miss Mackay, Mrs. Thomas Barwick, Mrs. George England, Mrs. U. G. Scollay and Mrs. J. A. Donnelly.

Board of Governors Appoints Committees

The following committees of the Board of Governors were appointed at

AUGUST KEHM, CHICAGO

Mr. Kehm has been elected a member of the Board of Governors of the American Society of Heating and Ventilating Engineers.

a meeting of the Board, immediately following the annual meeting:

Finance: Frank K. Chew, C. B. J. Snyder and John F. Hale.

Membership: R. C. Carpenter, B. F. Stangland and W. M. Mackay.

Executive: C. B. J. Snyder, W. M. Mackay and Frank K. Chew.

British Institution of Heating and Ventilating Engineers

The annual general meeting of the Institution was held February 18, 1908, at the hall of the Institution of Mechanical Engineers, in London. The programme included a presidential address by Mr. A. B. Simpson and the reading of two papers, one on "The Heating and Ventilation of School Buildings," by W. Nelson Haden, and the other on "Warming and Ventilation,' by W. H. Casmey. The summer meeting has been fixed for June 23 and 24, and the autumn meeting for October 6.

Evils and Restrictions of Carelessness

Wherever there is a lack of proper restraint on workers, we must expect more accidents than otherwise, which demonstrates the necessity of employers having an influencing control of their employees. We can never be the practical people we should be until this deficiency is very greatly overcome. This is the opinion of Mr. Thomas D. West, of Sharpsville, Pa., as expressed by him recently in an address before the American Foundrymen's Association.

Is it not time, he asks, that there was an awakening to the needs of a more practical training of the young and control of employees' actions to prevent loss of life and property than exists at the present time?

Can there be any form of education and training that is really more necessary to our existence than learning to be careful?

The second remedy lies in the enactment of laws whereby any person could be arrested, fined and imprisoned if found guilty of any carelessness that had resulted in maiming, killing or destroying property. Our laws are entirely too slack in this respect. To-day a smart-Aleck or careless person can do any amount of uncalled for damage to property saying nothing about the injury to his fellow workers, etc., and all the employer can do is to discharge him, and ten to one be laughed at for any voice he may give to vent his feelings for the gross injustice he and others suffer.

The third remedy that should be applied lies in devising plans to train youths to master, above all else, the quality of carefulness. We have our fire-drills for the purpose of preparing children to act in moments of peril. It would be no stretching of ingenuity to devise studies, methods and drills to develop and test carefulness. Where is there a school book to-day that contains a lesson on this life saving requisite? The adult that is graduated from college is no more trained in this important qualification than the child ending its primer.

The Weather During January

As in December, the weather during January, 1908, was unusually mild in most parts of the country, the two months constituting a record that has not been equalled in many years. Following are the weather reports from five representative cities for January, 1908:

NEW YORK

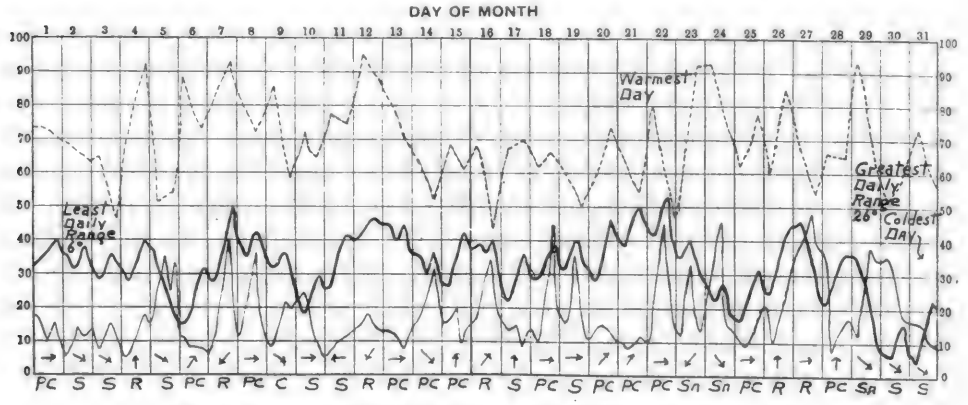
In New York, the highest temperature recorded was 53° on the 21st, and the lowest, 4°, on the 31st. The greatest daily range was 26° on the 29th and the least daily range, 6° on the 2nd. The mean temperature for the month was 32°, 2° above the mean of this month for 38 years. There was 3.84 inches of rain, 1.31 inches falling on the 12th. There was a snowfall during the month of 10.6 inches. The prevailing direction of the wind was northwest and the total movement 11,033 miles; average hourly velocity, 14.8 miles; maximum velocity for 5 minutes, 48 miles from the west on the 27th. There were 9 clear days, 14 days partly cloudy, 8 cloudy and 9 stormy.

PITTSBURG

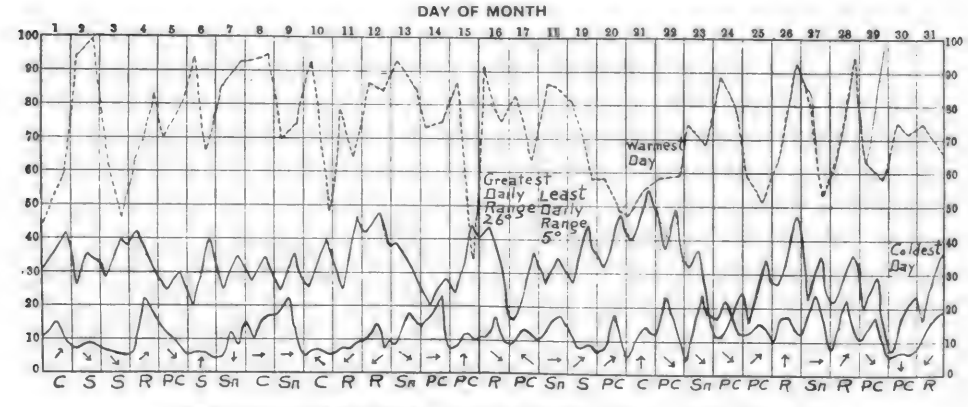
In Pittsburg, the highest temperature was 54° on the 21st and the lowest, 8° on the 30th. The greatest daily range was 26° on the 16th and the least daily range, 5° on the 18th. The mean temperature for the month was 30°, which is 1° below the normal temperature for 38 years. The total rainfall for the month was 1.65 inches, and the total snowfall, 6.9 inches. The greatest rainfall in any one day was 0.54 inches on the 31st; prevailing direction of the wind, northwest. There were 16 rainy days, 4 clear days, 1 day partly cloudy and 13 cloudy.

CHICAGO

In Chicago the mercury touched 49° on the 21st and 0° on the 29th. The



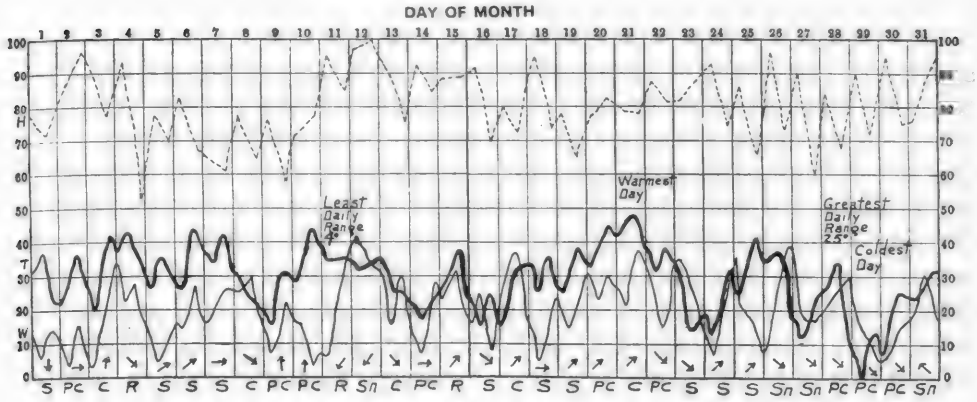
RECORD OF WEATHER IN NEW YORK FOR JANUARY, 1908



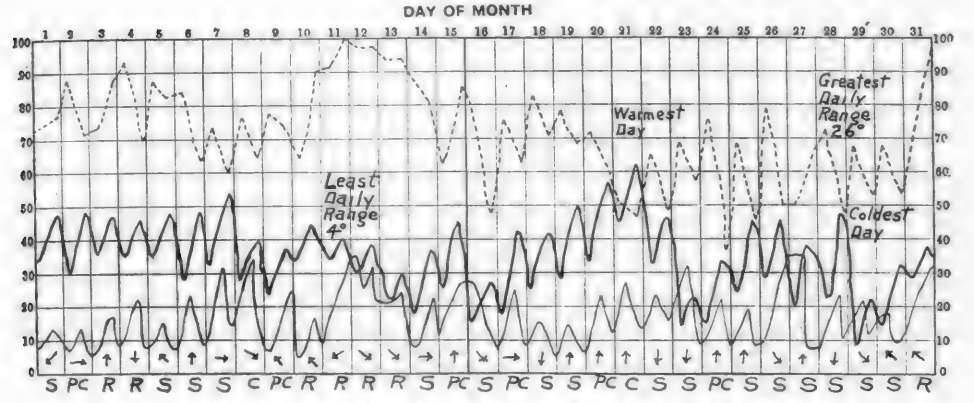
RECORD OF WEATHER IN PITTSBURG FOR JANUARY, 1908

Plotted from records especially compiled for THE HEATING AND VENTILATING MAGAZINE, by the United States Weather Bureau.

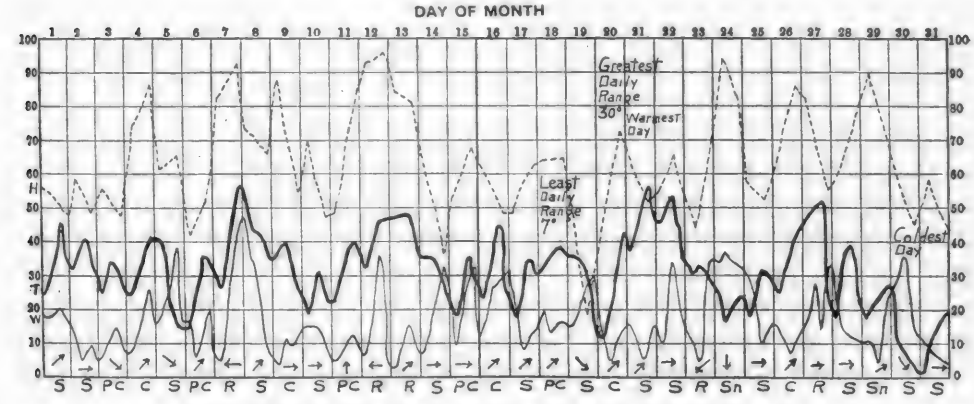
Upper line indicates temperature in degrees Fahr.
Dotted line indicates relative humidity in percentage from readings taken at 8 a. m. and 8 p. m.
Lower line indicates velocity of wind in miles per hour
Arrows fly with prevailing direction of wind
S—Clear. PC—Partly Cloudy. C—Cloudy. R—Rain



RECORD OF WEATHER IN CHICAGO FOR JANUARY, 1908



RECORD OF WEATHER IN ST. LOUIS FOR JANUARY, 1908



RECORD OF WEATHER IN BOSTON FOR JANUARY, 1908

Plotted from records especially compiled for THE HEATING AND VENTILATING MAGAZINE, by the United States Weather Bureau.

Upper line indicates temperature in degrees Fahr.
Dotted line indicates relative humidity in percentage from readings taken at 8 a. m. and 8 p. m.
Lower line indicates velocity of wind in miles per hour
Arrows fly with prevailing direction of wind.
S—Clear. PC—Partly Cloudy. C—Cloudy. R—Rain.

greatest daily range was 25° on the 28th, and the least daily range, 4° on the 11th. The mean temperature for the month was 29°, 5° above the normal temperature for 38 years. During the month 2.05 inches of rain fell and 13.2 inches of snow. The greatest amount of rain in any one day was 1.22 inches on the 12th; snow on ground at end of month, 3.1 inches; prevailing direction of the wind, southwest; total movement, 12,930 miles; average hourly velocity, 17 miles; maximum velocity for 5 minutes, 44 miles from the northwest on the 26th. There were 11 clear days, 10 partly cloudy, 10 cloudy and 7 stormy.

ST. LOUIS

The highest temperature recorded for the month was 61° on the 21st and the lowest, 9° on the 29th. The greatest daily range was 26° on the 28th, and the least daily range, 4° on the 11th. The mean temperature for the month was 34°, 2° above the average for 35 years. The total rainfall was 2.08 inches and the total snowfall, 6.0 inches. The greatest precipitation in any one day occurred on the 11th and 12th, when 1.05 inches were recorded. The average rainfall for 38 years is 2.45 inches. The prevailing direction of the wind was south; total movement, 9,710 miles; average hourly velocity, 13.0 miles; maximum velocity for 5 minutes, 36 miles per hour from the northwest on the 27th. There were 15 clear days, 7 partly cloudy, 9 cloudy and 7 rainy.

BOSTON

The highest temperature recorded for the month was 57° on the 21st and the lowest, 1° on the 30th. The greatest daily range was 30° on the 20th and the least daily range, 7° on the 18th. The mean temperature for the month was 31°, 4° above the average for 38 years. During the month 2.47 inches of rain fell and 4.2 inches of snow. The greatest amount of precipitation in any one day was 0.95 on the 7th. The prevailing direction of the wind was west; total movement, 10,329 miles; average hourly velocity, 13.9 miles; maximum velocity for 5 minutes, 48 miles from the southwest on the 7th. There were 14 clear days, 6 partly cloudy, 11 cloudy and 8 stormy.

Decision for National Regulator Company

The circuit court of appeals for the seventh circuit has handed down a decision in the case of the Powers Regulator Co. vs. The National Regulator Co., in which it upholds the contention of the National Regulator Co. that its graduated mixing damper is not an infringement on the Powers patent. The decision reverses that of the circuit court which held that the Powers patent was infringed.

The decision of the court of appeals is final and justifies the National Regulator Co. in the marketing of its device, the decision covering broadly a compressed air thermostatic device for operating mixing dampers for hot and cold flues in a graduated manner.

Trade Literature

Linolite, the modern system of lighting, is described in a folder issued by the H. W. Johns-Manville Co., New York, manufacturer of the device. As its name implies, it is a "line o' light." By placing end to end and close together in a continuous, semi-circular reflector a series of long, tubular incandescent lamps, with single filaments running from end to end in each lamp, an endless line of light of any desired length can be obtained. These lamps, which are held in the reflector by solid porcelain sockets, containing spring plungers, can be instantly removed and replaced.

Ilg Self-Cooled Motor Fans, direct and alternating current, also Ilg Forge Blowers, are interestingly described and illustrated with detail views, in circulars published by the Ilg Electric Ventilating Co., Chicago, whose New York office is located at 145 Chambers street. Price lists are given for each type of apparatus.

Rothchild "Inverted" Blow-Off Cock, manufactured by John Simmons Co., New York, is a new device designed especially for high steam pressures. Among the advantages of the valve are mentioned, Similarity of metal in contact; neutralization of unequal expansion; self-acting adjustment of contact pressure; minimum exposure of valve surface to current; introduction of a lubricant, and easy and quick operation. This method of construction eliminates the seat and disk, tapered plug and dissimilarity of metals in contact, features considered undesirable in blow-off cocks.

Robert Raitz & Co., Toledo, O., steam heating Cuyahoga County Courthouse; also blast heating systems for new Harvard and Milford Schools in Cleveland, and new High School in Wadsworth, O.

Ellis & Foster, Waterloo, Iowa, heating and plumbing Congregational Church at that place for $4,000; also heating and plumbing Fire station in Waterloo for $2,100.

Mullen Bros., Dubuque, Iowa, hot water heating, plumbing and gas fitting 130-room addition to St. Joseph's Infirmary at Dubuque.

A. Hattersley & Sons, Fort Wayne, Ind., heating and ventilating system for the new Anthony Hotel. The contract amounts to $14,412.20. Robert Spice, Fort Wayne, has the plumbing contract.

TRADE AND MISCELLANEOUS NOTES

Deaths

Charles W. Martin, Jr., assistant general manager of Jenkins Bros., valve manufacturers, died Dec. 31 of pneumonia at his home in New York. He was 37 years old. He had been with Jenkins Bros. for 22 years, entering their employ at the age of 15. He leaves a widow and two children.

Leffert L. Lefferts, of the Lefferts Galvanizing Works, who was formerly with the J. L. Mott Iron Works, died of apoplexy, January 9, at his office in New York. He was 67 years old.

Joseph J. Miller, of the Ajax Valve Co., Chicago, formerly manager of the Chicago branch of Jenkins Bros., was found dead near the railroad tracks at Oak Park, Ill. A widow survives him.

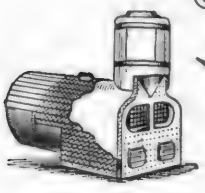
Manufacturers' Notes

H. W. Johns-Manville Co., New York, in accordance with its usual custom, held a convention of its branch managers in New York from January 29 to February 1. Branch managers of the company throughout the United States were present at the meeting and a general discussion of the business affairs of the company took place. As a fitting wind-up of the convention a dinner was tendered the managers at the Union League Club, on the evening of January 31. The convention was pronounced a decided success by all present.

A. M. Byers & Co., Pittsburg, pipe manufacturers, have made a proposal to the city council involving the taking over of a portion of a street adjoining their plant for a distance of about 600 feet. As an alternative to securing the city's consent to occupy the street in question, the company proposes to move its plant to Girard, Ohio, where its furnaces are located.

Burt Mfg. Co., Akron, Ohio, manufacturers of oil filters, ventilators, etc., has

TELEPHONE CALL 6097 FRANKLIN.



ROBERT A. KEASBEY CO.

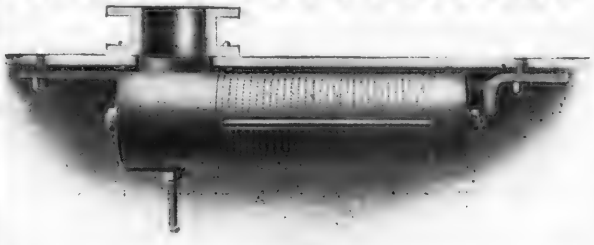
HEAT AND COLD INSULATING MATERIALS

HEADQUARTERS FOR
85% MAGNESIA, ASBESTOS AND BRINE
PIPE COVERINGS, ASBESTOS PRODUCTS, ETC.

ESTIMATES FURNISHED AND CONTRACTS EXECUTED.

100 NORTH MOORE ST, NEW YORK CITY.

SAFETY AND ECONOMY



are both increased by using "THE POTTER" MESH SEPARATOR, the only efficient boiler dry-pipe.

We guarantee dry steam at the boiler outlet, and make good our guarantee.

WRITE FOR BOOKLET

POTTER SEPARATOR CO., - - 4 Front Street, NEWBURGH, N. Y.
New York Office, 39 Cortlandt Street

reëlected its officers as follows: W. F. Warden, president and general manager; H. F. Maranville, vice-president; M. E. Knowles, second vice-president; J. Asa Palmer, secretary. The company reports an increase of 25% in its sales during 1907 over the previous year.

William H. Page Boiler Co., Norwich, Conn., suffered a loss by fire January 14 when its plant was damaged to the extent of $50,000.

Warren Webster & Co., Camden, N. J., has recently sold four Webster air washers and humidifiers for installation in the new Armour Co.'s office building, Chicago. The company has organized a regular department for the design and manufacture of the Webster air washer, in charge of William G. R. Braemer, formerly of Buffalo.

J. Regester's Sons Co., Baltimore, Md., manufacturer of brass goods, suffered a loss by fire January 24, when its plant was destroyed. Four firemen were killed and 15 others injured by falling walls.

Fowler & Wolfe Mfg. Co., Philadelphia, Pa., announces the election to the office of secretary of the company of Homer Addams, formerly of the Model Heating Co., Philadelphia.

Kennedy Valve Mfg. Co., announces that its main offices are now located at its new plant at Elmira, N. Y.

Miscellaneous Notes

Practical Advertising is a special course of study (evening sessions) that was inaugurated by the New York University School of Commerce, Accounts and Finance, February 8, last. The sessions are held at the University Building, Washington Square, East, New York, and will continue through February, March, April and May. The tuition for the complete course is $15.00.

Cleveland, O.—The Mills ordinance, regulating the heating and ventilation of street cars in Madison, was passed unanimously by the city council. Under the new regulation, the temperature in the car must not go below 45°; the cars must be kept clean and freely ventilated. A fine of not less than $10 nor more than $50 is imposed for each offense.

Toledo, O.—By unanimous vote, the city council revoked the franchise granted the People's Heat & Power Co. last September. Homer T. Yaryan was behind the company.

Ogden, Utah.—A movement is on foot among the business men of Ogden to install an independent heating and lighting plant to supply business houses on Washington avenue. It is claimed that the present rate of the Utah Light and Railway Co. is excessive.

New York.—The commissioner of public works of New York City has appealed to Governor Hughes to include the steam heating service in the bill widening the jurisdiction of the Public Service Commission. This move is of general interest because the distribution of heat from central stations is becoming so prominent an enterprise in all large centers of population. The petition of the New York official is based upon the terms of the present franchise of the steam heating company, which gives it the right to break pavements at any point, at any time, for the purpose of making repairs or laying pipe.

Crystal, Mich.—A proposal for a town heating system has been made by O. A. Sanford who is installing a large new boiler in his mill at that place. Mr. Sanborn proposes to run a steam pipe from his mill uptown to carry steam heat to the different buildings in town.

Pittsburg, Pa.—A strike of steam fitters went into effect January 1, the demand being for an increase in wages of from $4.00 to $4.50 per day.

Brunswick, Me.—An explosion of a hot water boiler December 1 last in the railroad station at that place killed one man and severely injured several others.

William Grier, has been appointed a Pittsburg representative of the Model Boiler Co., of Philadelphia.

A decision of the Ohio Supreme Court, handed down January 21, in connection with the Toledo ice cases, in which a number of ice dealers were indicted for violating the Valentine anti-trust law, holds that the Valentine law is valid and constitutional. The ruling will have an important bearing on the cases of the master plumbers who were indicted last spring for violating the same law, forming a conspiracy in restraint of trade. It is feared that unless the decision is reversed by the United States Supreme Court, the cases now pending against the master plumbers will be decided against them.

New Incorporations

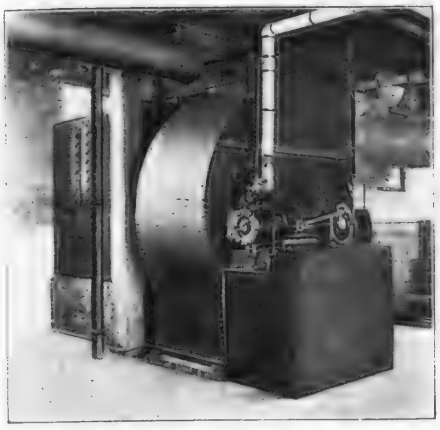
Liberty Compound Co., New York, incorporated to manufacture marine and stationary boiler compounds and elevator emulsions. The principals of the firm are Harry N. Bennett and James O. Westburg, late of the Bird-Archer Co.

Memphis Heating Co., 93 North Second street, Memphis, Tenn., capital stock, $20,000. Incorporators: James H. Mahorney, Frank Donlon, H. R. Boyd, W. C. Foulkes and C. H. Trimble.

Chenango Valley Heating Co., Binghamton, N. Y., capital $6,000, to manu-

The Green Steam Heater

is rationally designed to transmit the greatest amount of heat per square foot of surface, and at the same time to be simple and substantial in construction and easily inspected, cleaned or repaired.



GREEN HEATER, FAN AND ENGINE

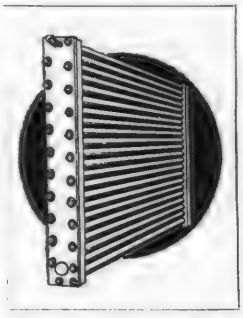
¶ The tubes are straight, and, by removing the cover plate of the cast-iron header, the interiors of the tubes can be inspected and cleaned or a leaky pipe can easily be mended, plugged or removed. The tubes are standard one-inch pipe, which can be bought anywhere and inserted by anyone who knows how to expand a tube into a header. There are no leaky elbows.

¶ As the steam or water flows through the tubes in a uniform and positive stream, there are no spaces that can become air bound, nor do some tubes offer shorter passages for the steam than do others, as in U-shaped sections. Further, the steam cannot pass directly from inlet to outlet without going through the pipes, as it can in many types. All the steam must pass through the tubes in order to get through and out, and every tube must receive some steam. The course of the steam is always downward, and drainage is therefore perfect.

¶ The construction of this coil, permitting it to be cleaned easily, makes it especially suitable for the utilization of exhaust steam containing oil, or for cooling by means of the circulation of cold water, since deposits of scale and sediment are easily and quickly removed.

¶ We are selling these heaters with a guarantee that with given temperatures and air velocities, a given amount of heat will be transmitted. Among many other installations are the Kimberly & Clark Paper Mills, the Atlas Wire Co., the Sherman Envelope Co., the Diana Paper Co., the Fargo & Morehead St. Railway Co., New York Public Schools, Worcester and Providence Technical Institutes, The Great Northern, The Chicago & Northwestern and Atchison & Santa Fe Railways.

¶ The Green Heater enables you to get the most heat transmission from the least number of lineal feet of heating surface. ¶ Ask for our "Heating and Ventilating Booklet" 109 HV and our Treatise 107 HV on "Drying Materials."



SINGLE SECTION OF GREEN HEATER

THE GREEN FUEL ECONOMIZER CO.

MATTEAWAN, N. Y.

NEW YORK CITY, BOSTON, CHICAGO, ATLANTA,
SAN FRANCISCO, LOS ANGELES, SEATTLE, SALT LAKE CITY, MONTREAL

Engineers; Builders of Green's Fuel Economizers, Fans, Blowers and Exhausters, Steam Air Heater Coils, Waste Heat Air Heaters, Mechanical Draft, Heating and Ventilating and Drying Apparatus, Draft Dampers and Engines.

facture furnaces and heaters. Directors: A. D. Vosburgh, H. A. Chittenden, G. W. Vosburgh and P. E. Lynch.

South Louisville Light & Heating Co., Louisville, Ky., capital $60,000, to deal in natural gas. Incorporators: Peter Arlund; J. C. Long and F. V. Bosemer.

Black Heat Regulator Co., St. Louis, Mo., incorporated to deal in heat regulators and fuel-saving devices, etc. Capital stock, $35,000. Incorporators: E. L. Black, and Lewis A. Painter.

Builders' Supply Co., Memphis, Tenn. Capital, $10,000. Incorporators: Edward J. Rank, A. J. Olson and others.

Pittsburgh Portable Radiator Co., Pittsburg, capital $100,000, to manufacture a hot water radiator made of pressed steel and heated by a gas burner. Agencies have been established in the principal cities. President, John T. Humbird; secretary, J. Smith Humbird, Jr.; treasurer, G. Torrence Miller.

Vanderman Bros. Co., Hartford, Conn., incorporated to take over the business of the Vanderman Heating, Plumbing & Heating Co. Incorporators: William F., Edward L., and Charles A. Vanderman.

Monarch Ventilator Co., New York, capital $100,000, to manufacture ventilators.

Business Chances

Washington, D. C.—Sealed proposals will be received at the office of the Supervising Architect, Treasury Department, for the following-named work:

Until March 5, 1908, for the construction, including plumbing, gas piping, heating apparatus, electric conduits and wiring of the U. S. Post Office at Red Wing, Minn.

Until March 4, 1908, for the construction (complete) of the extension to the U. S. Post Office, Court House and Custom House at Duluth, Minn.

Until March 2, 1908, for the construction (including plumbing, gas piping, heating apparatus, electric conduits and wiring, of the U. S. Post Office and Court House at Colorado Springs, Colo.

Until March 8, 1908, for the construction (complete except lift) of the extension to the U. S. Court House, Post Office, etc., at Rochester, N. Y.

Until March 13, 1908, for the installation of the hot water heating and ventilating apparatus, etc., for the U. S. Court House, Post Office, etc., building at Los Angeles, Cal.

Columbus, O.—Engineer Conrad Metzger of the county court house has recommended to the county commissioners the installation of a vacuum heating system in the court house, as the present apparatus is outworn.

St. Charles, Ill.—The Free Methodist Church is planning a new heating system for its building at West Walnut and Third streets.

Milwaukee, Wis.—A ventilating system, to cost at least $6,000, will be installed in the Wauwatosa High School building, an ordinance to that effect having been adopted January 24.

Madison, Wis.—At a meeting of the executive committee of the Normal regents of Madison, it was decided that the new school will be heated by a vacuum heating system.

Waukon, Ia.—Bids will be received until March 2, 1908, for the installation of a steam heating and ventilating plant in the Waukon Public School building. E. D. Purdy is the secretary of the board of directors and will receive the bids.

St. Paul, Minn.—The school board is discussing the matter of supplying new heating and plumbing apparatus for five school buildings.

Little Rock, Ark.—The State Board of Charitable Institutions will advertise for bids for new heating plants for the buildings at the State Hospital for Nervous Diseases.

Hartford, Conn.—Plans are being discussed for a central heating plant for the Capitol, Armory and State Library building. Benjamin W. Morris and Don Barbour, architects, were appointed a committee to report on the matter. It is expected that the central heating plant will be erected north of the Armory, the heat being carried through pipes to the other buildings.

Business Troubles

Marshalltown, Ia.—A receiver has been appointed for the Peterson Heat, Light & Water Co., with headquarters in Des Moines. The company is an Arizona corporation doing business in Des Moines, Chicago, Denver, Phoenix, Ariz.; Iowa Falls and Marshalltown.

Dayton, Ill.—Cooper Car Heater Co., incorporated a few months ago, has failed for $10,000. The liabilities are placed at $15,000. The firm started with an authorized capital of $100,000, of which $90,000 is issued in stock. J. A. Gauthier was appointed receiver.

Lexington Plumbing Co., Lexington, Ky., has failed with assets of about $12,000; liabilities not stated. J. T. Slade, Sr., is president of the company and D. D. Slade, secretary.

Business Changes

Denison, Ia.—The Carpenter Co., heating and plumbing contractors, has removed to Marion, Ia.

The Widely Advertised and Much Talked of POWERS PATENT IS INVALID!

CIRCUIT COURT OF APPEALS FOR THE SEVENTH CIRCUIT

(Judges Grosscup, Baker and Seaman) hold

POWERS GRADUATED MIXING DAMPER PATENT

TO BE INVALID

and therefore **not infringed** by the National Regulator Company.

The following letter from our counsel fully explains the decision:

JONES, ADDINGTON & AMES,
ATTORNEYS AND COUNSELORS

CHICAGO OFFICE
810 TITLE AND TRUST BUILDING
100 WASHINGTON ST.
TELEPHONE, CEN. 2627

W. CLYDE JONES
KEENE H. ADDINGTON
ROBERT LEWIS AMES
ARTHUR B. SIEBOLD

EDWIN B. H. TOWER, JR.
W. C. MARGESON
WM. PERRY HAHN
ADOLPH A. THOMAS
CHARLES L. HOPKINS
RICHARD HOLLEN

NEW YORK OFFICE
1904 UNITED STATES EXPRESS BLDG.
2 RECTOR STREET
TELEPHONE
4482 RECTOR

Chicago, Ill., February 8, 1908.

National Regulator Company,
Chicago, Ill.

Gentlemen:—

We beg to advise you that the Circuit Court of Appeals for the Seventh Circuit (Judges Grosscup, Baker and Seaman) has just rendered a decision holding invalid the Powers Patent No. 558,610, of April 21, 1896, and purporting to cover broadly a compressed air thermostatic device for operating mixing dampers for hot and cold flues in a graduated manner.

His Honor Judge Kohlsaat, of the Circuit Court, held the Powers patent to be valid and infringed by your Company, and this decision is now reversed by the Court of Appeals. There is no appeal from the decision of the Court of Appeals.

Appeal truly yours,
Jones, Addington & Ames.

THE NATIONAL REGULATOR COMPANY is prepared to promptly fill all orders for **any** character of Temperature Regulating Apparatus, **anywhere**, and at **any time**, and respectfully solicits your orders.

NATIONAL REGULATOR COMPANY,
334 Dearborn Street, CHICAGO, ILL.

NEW YORK, 1135 *Broadway*
LOS ANGELES, *Machinery & Electrical Co.*
LONDON, *Atmospheric Steam Heating Co., Ltd.*

Pettit-Galloway Co., Little Rock, Ark., has succeeded to the business of the heating and plumbing business of Pettit & Baird and Galloway & Sherry. E. N. Pettit, presdent; J. R. Hughes, vce-presdent; D. F. S. Galloway, secretary; and J. H. Baird, treasurer.

Hackney Bros. Co., Charlotte, N. C., has taken over the plant of Hackney Bros., and will continue the heating and plumbing supply and contracting business carried on by Hackney Bros. Capital stock, $100,000. President, L. L. Hackney; secretary, W. R. Hackney.

Knox-Gilchrist Co., Buffalo, N. Y., has succeeded W. J. Gilchrist, heating and plumbing contractor. President and treasurer, R. T. Knox.

Sun Power Co., Tacony, Pa., has been organized to market the Schuman direct-acting solar engine. This device is the invention of Frank Schuman. The engine is operated by steam obtained through the use of the sun's rays as a heating medium. A typical apparatus consists of a huge flat box, 18 x 60 ft., lined with pipes and exposed to the sun through a double layer of glass, the air space between the layers acting as an insulator. The rays are not concentrated, the sun simply beating down upon the pipes. A condenser is located at one side of the apparatus to which the exhaust of the engine is connected, the water flowing back to the pipes in the flat box where it is again heated. In a test with water, a steam pressure of 15 lbs. was obtained in the boiler and where ether was used, a pressure of 90 lbs. was obtained. In the latter case, with an engine operating a centrifugal pump, 100,000 barrels of water were pumped in one day against a head of 6 ft. The plant described was installed at a cost of $1,500.

Albert Schade Co., Philadelphia, Pa., is a new firm organized to manufacture heating specialties. Albert Schade, Leroy M. Lewis and Louis Schade are the principals.

Contracts Awarded

E. W. Whitacre Boiler & Heating Co., Wellsville, W. Va., hot water heating system, with two boilers, in E. E. Knowles' new residence at Newell, W. Va.

McGinness-Smith Co., Pittsburg, Pa., steam heating Lewis Foundry & Machine Co.'s new office building, Groveton, Pa.; also heating the $32,000 M. E. church at Bellevernon, Pa.

Modern Heating Co., Wilkinsburg, Pa., steam heating Geo. H. Shickler's two apartment buildings.

Zinc-Coated Steel Slip Nipples

For Steam and Hot Water Radiators and House Heating Boilers

THE PRATT CHUCK CO., Frankfort, N.Y.

FREE SAMPLES furnished to interested parties

Childs Bros., McKeesport, Pa., heating and plumbing addition to McKeesport Hospital.

M. J. Gibbons, Dayton, O., steam heating and ventilating a new memorial building, that city, for $10,500.

Braman, Dow & Co., Worcester, Mass., piping and changing the heating system in the Stoddard, Haserick & Richards factory; also piping for the power plant and heating of the Hovey laundry.

Fitzpatrick & Hoepfner, Columbus, O., heating and plumbing the new $1,000,000 Hotel Patton, Chattanooga, Tenn.

John Redmond, St. Charles, Ill., direct steam-heating system in the Crown Electrical Mfg. Co.'s new factory building.

Western Heating Co., St. Louis, Mo., steam heating large building for the Henry Kendall College, at Tulsa, Okla.

John Burleigh & Co., Worcester, Mass., remodelling steam heating system in factory of Coes Wrench Co., also new office building of same company.

Cushing Bros., Detroit, Mich., heating and plumbing casino and public convenience station on West Grand Boulevard.

D. F. Boyle, Detroit, Mich., contract for heating and plumbing new Pennsylvania railroad station in New York City, one of the largest stations in the world.

National Plumbing & Heating Co., Pittsburg, Pa., hot-water heating and plumbing in new $20,000 residence at Schenley Farms.

Burns-Fleming Co., Pittsburg, Pa., steam heating Civic Club's new bathhouse.

P. F. Maginn & Co., Pittsburg, Pa., hot water heating $28,000 residence at Aspinwall, Pa.; also steam heating Berger store and apartment building at New Castle, Pa.

Central Supply Co., Worcester, Mass., 30,000 ft. wrought steel water pipe for city water service in 1 and 1¼ in. sizes.

Edwin Hawes Co., Worcester, Mass., steam heating Ellen Gould Smith's new apartment house.

A. Burlingame & Co., Worcester, Mass., steam heat and steam power in David Gessner's new factory.

John G. Sutton Co., San Francisco, Cal., steam heating First Federal Trust Co.'s new $1,500,000 building.

Mohawk Valley Heating Co., Utica, N. Y., heating new Church of the Reconciliation, Utica.

WEBSTER STEAM SPECIALTIES

What do you Expect?

People who have lived with old-fashioned steam pipes, or ordinary heating systems, can hardly appreciate the

WEBSTER SYSTEM OF STEAM CIRCULATION

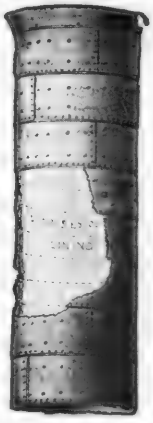
at first. They have not learned to expect enough.

You should expect a heating system to keep one person's room at 65°, even if the next keeps his at 80°; to be as noiseless as a sleeping cat; to "lift" the water of condensation over a two-foot wall if necessary; and yet to cost the least for fuel.

Write us to-day for booklet 17 H, and learn how to get all this.

WARREN WEBSTER & Co.
CAMDEN, N. J.

VITRIBESTOS SMOKE STACK LINING



A vitrified asbestos lining two inches thick, *weighing only one-tenth* as much as brick lining and *costing one-half* as much.

It is not affected by sulphurous or other gases of combustion; therefore, protects the stack from the action of these gases. Is waterproof. Will stand a heat of 800 degrees. Can be sawed, drilled, cemented, split and handled like wood.

Write Nearest Branch for Catalog 108

H. W. JOHNS-MANVILLE CO.

ASBESTOS "J-M" MAGNESIA

New York	Baltimore
Milwaukee	New Orleans
Chicago	Kansas City
Boston	Minneapolis
Philadelphia	San Francisco
St. Louis	Los Angeles
Pittsburg	Seattle
Cleveland	Dallas
Buffalo	London

[730]

Weatherly Co., Grand Rapids, Mich., heating building of the Children's Home, at $6,000.

Chapman Heating Co., Canton, O., hot water heating system for new church.

Campbell Heating Co., Des Moines, Iowa, heating Dodge Avenue M. E. Church at Wichita, Kan.

Fargo Plumbing & Heating Co., Fargo, N. D., heating and ventilating new school house at Rolla, $3,490.

Lewis & Kitchen, Kansas City, Mo., heating and ventilating plant, boiler equipment, automatic regulation and refrigeration of the General Hospital, at Kansas City.

Nelson & Anderson, Boone, Conn., hot water heating the P. A. Swanson new brick building in Stratford, Conn.

E. D. Hough, Los Angeles, Cal., low-pressure steam-heating system in three-story store and apartment house.

Chas. W. Light, Saginaw, Mich., heating and ventilating school building at Leipsic, Ohio.

Advance Engineering & Construction Co., St. Louis, Mo., plenum heating system in the new normal school buildings at Springfield, Mo.

A. F. Hollis, Owosso, Mich., heating new High School building at Morenci, Mich.

Leighton Plumbing & Heating Co., Bangor, Me., heating new Agricultural Building at Orono, Me.

Willey & Calhoun, Portland, Me., heating and plumbing in new Savings Bank building, Portland.

Geo. L. Learned & Co., Waterville, Me., heating Waterville Trust Co.'s new building at that place.

Frank O. Houghton Co., Worcester, Mass., steam heating the De Marco's block.

J. F. Davidson, So. Sharon, Pa., steam heating F. J. Warton's $25,000 hotel at Sharon.

American Warming & Ventilating Co., Pittsburg, Pa., heating new $35,000 school building at Beaver, Pa.

W. J. Davidson, Beaver Falls, Pa., hot water heating E. E. Davidson's $20,000 residence at Beaver, Pa.

Kress & Smith, Beaver Falls, Pa., heating and plumbing new M. E. church at Beaver.

Oscar H. Nick, Erie, Pa., steam heating Erie Co. Milk Association's new business building, in that city.

O'Toole Bros., Clinton, Mass., steam heating four-apartment house for Mallman & Buckman of Leominster, Mass.

Elias Berla, Newark, N. J., heating Hawthorne Avenue school in Newark.

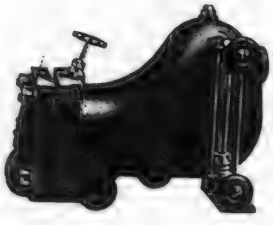
C. M. Parks Co., Fitchburg, Mass., hot water heating $400,000 addition to Lawton Spinning Co.'s factory at Woonsocket, R. I.

Wanted

Chicago concern, selling to heating and ventilating contractors throughout the northwest, desires exclusive agencies for steam specialties, pipe covering, mechanical hot blast heating and drying equipment, etc. Address Western, care of THE HEATING AND VENTILATING MAGAZINE.

McDaniel Improved Steam Trap

WILL DO THE WORK



When you need a Steam Trap buy one you know will work. With a McDANIEL we take all the chances. Don't pay until you are satisfied. We have been 25 years manufacturing Steam Traps and know there is no better trap made. May we send you one for trial?

Watson & McDaniel Co.

160 North 7th Street - PHILADELPHIA, PA.

Send for Catalogue

THERMOSTATIC EFFICIENCY

NATIONAL REGULATOR CO.

CHICAGO **NEW YORK**

Cash Standard pressure reducing and regulating valves, sold by A. W. Cash, 20 Court street, Newark, N. J., are meeting with much favor among engineers on account of their full size openings and sensitive action. Among the many large users of Cash Standard valves are the Clark Thread Co., Cawley-Clark Co., P. Reilly & Son, the Watts Campbell Co., all of Newark, N. J.; Buffalo Forge Co., Buffalo, N. Y.; Green Fuel Economizer Co., Matteawan, N. Y., Hoboken Land Improvement Co. Power House, Hoboken, N. J., Westinghouse, Church, Kerr & Co., New York; B. T. Babbitt's New Soap Works, Babbitt, N. J.; also the turbine steamers Yale and Harvard of the Metropolitan S. S. Co.

J. H. Kinealy's Works

(Past-President Am. Soc. H. & V. Eng.)

For Heating and Ventilating Engineers

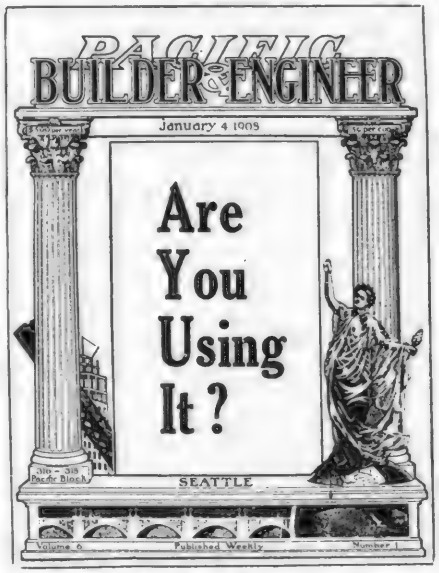
LOW PRESSURE STEAM HEATING CHARTS for dwellings and other small buildings constructed of various materials, with descriptive notes. $1.00 ‡.

MECHANICAL DRAFT, a practical handbook for engineers and students, with formulae and tables and ten plates. Cloth, $2.00 ‡.

CENTRIFUGAL FANS, a theoretical and practical treatise on Fans for moving air in large quantities at comparatively low pressures, with numerous tables, formulae and illustrations. Full limp leather pocketbook. $5.00 ‡. Descriptive Circulars free.

SPON & CHAMBERLAIN

123 V Liberty St., New York



If not, you are losing the best chance of your life of getting before the buyers of a section where business is rapidly reviving, buildings and new plants are being put up, and old equipments being overhauled and renewed. ¶ 44 pages every week of fresh Advance Information. $5.00 per year.

Send for Sample Copy—FREE.

316-A PACIFIC BLOCK, SEATTLE, U. S. A.

EMPIRE STATE ENGINEERING COMPANY

ENGINEERS AND MANUFACTURERS

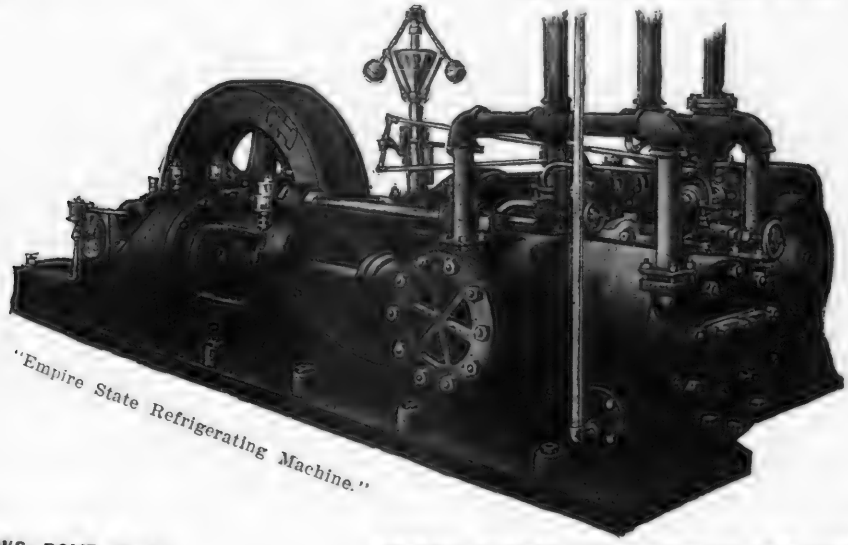
Builders of **ICE and REFRIGERATING MACHINERY**

Engines, Fans, Blowers and the LEYLAND AUTOMATIC LUBRICATOR.

The Maxfield Steam Engine

For belting or direct connecting to dynamos, pumps, blowers, stokers, disc fans and general power 3 H. P. to 30 H. P. All speeds. Small space.

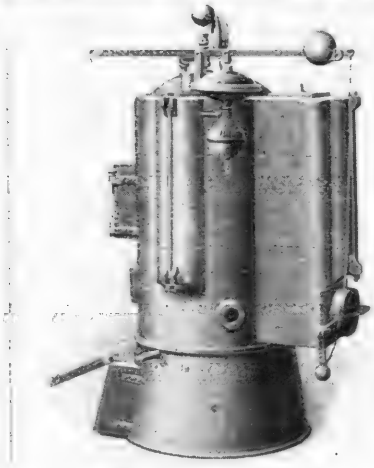
Dust proof, durable, simple, efficient.



"Empire State Refrigerating Machine."

WORKS: ROME, N. Y., **GENERAL OFFICES: 149 BROADWAY, NEW YORK CITY**

BOILERS-RADIATORS



BUNDY JEWEL STEAM AND WATER BOILER

BUNDY GOODS are distinctive in character and make-up. Our very complete line of cast iron house heating Boilers and Radiators enables us to fill every known requirement in the heating line.

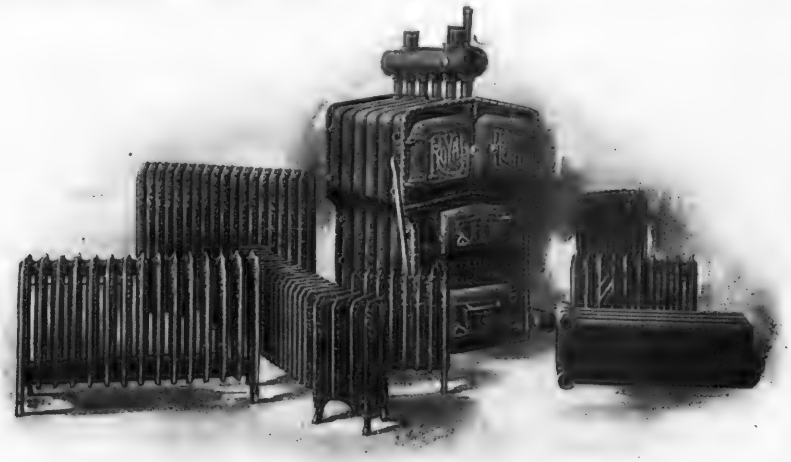
Boilers: Horizontal and Upright; Radiators: one, two, three and four column, plain and ornamental.

Catalogs, prices upon request. Goods right, prices right, deliveries right.

A. A. GRIFFING IRON COMPANY

Branches:
BOSTON, MASS., 70 Kilby St.
PHILA., PA., 380 Bourse Bldg.

OFFICE AND WORKS:
JERSEY CITY, N. J.



Let us send you a few copies of "Heating and Ventilating the American Home"—an article in booklet form. You can distribute these to advantage among prospective homebuilders in your town.

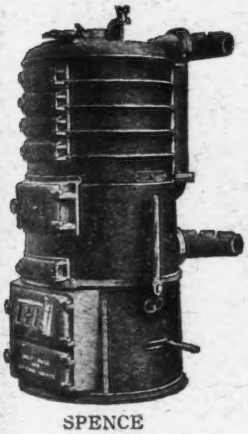
HART & CROUSE CO.

Home Office: Utica, N. Y.

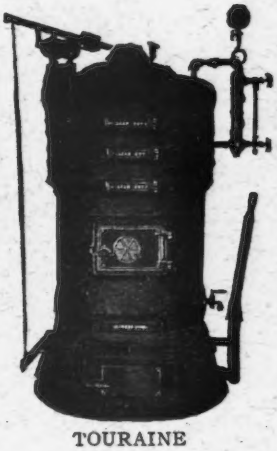
BRANCHES:
New York, 235 Water St. **Chicago, 80 Lake St.**
Dallas, 659 Elm St. **Columbus, Poplar and Henry Sts.**
Minneapolis, 742 Lumber Exchange.

Prompt Shipments

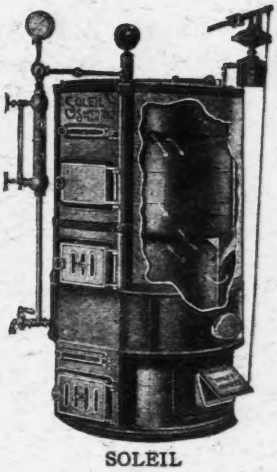
Our facilities for shipping both Boilers and Radiators with fittings and supplies from one point make PIERCE BOILERS the most satisfactory line to handle.



SPENCE



TOURAINE



SOLEIL

Do not overlook the reliability of Pierce Products. They are backed by our 30 years' manufacturing experience. Their use means satisfied customers.

A Boiler for Any Requirement Can Be Found in the List

STEAM BOILERS		WATER BOILERS	
AMERICAN	TOURAINE, JR.	ADVANCE	TOURAINE
SOLEIL	ONTARIO	SPENCE	TOURAINE, JR.
TOURAINE	FLORIDA, JR.	IMPROVED TROPIC	ONTARIO
FLORIDA	IMPROVED GIANT	TROPIC	TROPIC, JR.
IMPROVED FLORIDA		PERFECT	IMPROVED GIANT

Send for Catalogues to-day

Pierce, Butler & Pierce Mfg. Co.

Dept. R, Syracuse, N. Y., U. S. A.

New York	Boston	Philadelphia
254 Fourth Ave.	61 High Street	831 Arch Street

Waste Stops.

No use trying to save needful labor; but it's right important to save the wasted work! That is where IDEAL Boilers and AMERICAN Radiators offer valuable fitting advantages; no need for waste labor in their erection, connection, going back, changing, etc., and contract profits are not concaved by "over-running the time estimate," as caused by cheap devices.

IDEAL Boilers go together, easily and tightly, with less time than any in the market—lowest setting costs possible. AMERICAN Radiators are specially made to prevent every arm stroke of waste labor—undergo *three tests* to insure tightness and satisfaction.

AMERICAN & IDEAL
RADIATORS BOILERS

AMERICAN Radiators have tight, labor-saving connections, yet changes in size can be made quickly when necessary.

AMERICAN RADIATOR COMPANY

General Offices: 282-284 Michigan Ave., Chicago

NEW YORK	CINCINNATI	CLEVELAND	OMAHA	BRANTFORD
BOSTON	ATLANTA	INDIANAPOLIS	KANSAS CITY	LONDON, E. C.
PHILADELPHIA	DETROIT	ST. LOUIS	DENVER	PARIS
BUFFALO	CHICAGO	MEMPHIS	SAN FRANCISCO	BERLIN
PITTSBURG	MILWAUKEE	MINNEAPOLIS	SEATTLE	